Jacques Cousteau (JAC) NERR Water Quality Metadata
1 January 2022 – 31 December 2022
Latest Update: October 8, 2023

I. Data set and Research Descriptors

1) Principal investigator & contact persons

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2) Entry verification

Deployment data are uploaded from the YSI data logger to a Personal Computer (IBM compatible). Files are exported from KOR Software in an Excel File (.XLS) and uploaded to the CDMO where they undergo automated primary QAQC; automated depth/level corrections for changes in barometric pressure (cDepth or cLevel parameters); and become part of the CDMO's online provisional database. All pre- and post-deployment data are removed from the file prior to upload. During primary QAQC, data are flagged if they are missing or out of sensor range. The edited file is then returned to the Reserve for secondary QAQC where it is opened in Microsoft Excel and processed using the CDMO's NERRQAQC Excel macro. 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. For more information on QAQC flags and codes, see Sections 11 and 12. Data management is handled by the JCNERR's SWMP Technician, Gregg P. Sakowicz.

3) Research Objectives

The water quality of the Mullica River and Great Bay has traditionally been relatively clean and free of excessive nutrient loading from anthropogenic sources. This is due to the fact that there is very little development or industry within the drainage basin of the Mullica River and its tributaries. Great Bay had a large source of nutrient loading coming from a menhaden fish processing factory that was in operation from the early 1930's to the early 1960's and affected the lower portion of the bay. The river is relatively deep, three to nine meters in the section that is monitored. Great Bay averages about two meters in depth. The river also has a dark color due to tannins and humic compounds that are a natural product coming from the Pine Barrens and are present in large amounts within the river. It is believed that nutrients entering the river upstream do not get utilized within the river because of the lack of light penetration. The great depth of the river and the dark color from the tannins flowing down the river from the Pine Barrens hinders the utilization of these nutrients by planktonic organisms. Where the river empties into the bay, light penetration reaches the bottom of the bay and allows the utilization of the nutrients by phytoplankton, making this region more productive (Durand 1979). Water circulation questions within this unique estuary can be addressed by the use of datasondes. Because of the close proximity of the lower station (site name: B6) to Little Egg Inlet, the effects of an influx of ocean water can have dramatic effects on both the water quality and on the biological aspect of the region. Upwelling along the coast is a common occurrence during the summer months. The influx of this water into the bay can and does affect larval fish transport into and out of the bay. The cooler ocean waters can have dramatic effects on the growth rates of many different species living in the area. Datasondes have been useful in tracking the physical changes within the estuary due to occurrences such as upwelling and storm events and will be helpful in translating the resulting biological events.

4) Research Methods

YSI datasondes (a.k.a. "dataloggers") are programmed to record temperature, specific conductance, salinity, dissolved oxygen, depth, pH, and turbidity every 15 minutes. Exo2 datasondes were utilized at the JC NERR. Presently, four SWMP monitoring stations are established in the Mullica River/Great Bay Reserve. These monitoring sites extend from the fresh water/salt water interface at Lower Bank, approximately 25 kilometers up the Mullica River from the point where it joins Great Bay to the mouth of Great Bay, a distance of eight kilometers. Thus the datasondes cover a total of 33 kilometers in this estuarine system.

Calibration standards required for pH were purchased from Y.S.I. (p/n 003822 (pH 7) and 003823(pH 10)). A two-point calibration was employed for pH, the first being pH 7 followed by pH 10. Calibration of the pH probe (p/n 599702) was performed via immersion in the standard and using the calibration feature of the KOR software and accepting the set-point after stable readings were obtained.

Calibration standards required for conductivity were purchased from Y.S.I.. A standard of 10 mS/cm (p/n 060911) was used to calibrate for conductivity. Calibration of the conductivity probe (p/n 599872) was performed via immersion in the standard and using the calibration feature of the KOR software and accepting the set-point after stable readings were obtained.

Dissolved oxygen was calibrated via immersion in a bucket of oxygen-saturated tap water and utilizing the dissolved oxygen calibration function of the datasonde(s). Oxygenation of the water was accomplished via aeration with an aquarium pump and air-stone for a minimum of 2 hours to saturate tap water prior to calibration. Calibration of the dissolved oxygen probe (p/n 599100-01) was performed via immersion in the aerated water and using the calibration feature of the EcoWatch or Kor software and accepting the set-point after stable readings were obtained.

Calibration of the turbidity probe (p/n 599101-01) was performed with a 0 FTU (Formazin Turbidity Units) solution (de-ionized water) and a 124 FTU standard (supplied by YSI, inc., p/n 607300). Calibration of the Turbidity probe was performed via immersion in each standard and using the calibration feature of the KOR software and accepting the set-point after stable readings were obtained.

Used conductivity and pH standards were stored for rinsing probes and performing post-deployment calibration-checks after retrieval and prior to cleaning loggers. Great care was taken to clean the datasondes before calibration, and each used standard was used once as a post-calibration solution and once as a rinse solution before being discarded (unless contamination or dilution was observed or suspected).

Datasondes were deployed by inserting them in PVC pipes that are affixed to a permanent structure (i.e. two US Coast Guard channel markers (jacb6wq and jacb9wq), one commercial dock (jacnewq), and one bridge (jacbawq). The bottoms of the pipes were situated between approximately 0.5 and 1m above the sediment (the variability is the result of currents and shoaling leading to variability of the relative level of sediment below the sonde tubes). A line was used to lower and recover the datasondes within the pipes. A cross-pin (stainless steel or titanium bolt) was inserted across the bottom of the pipe and served as an end-stop for the datasonde during its descent, assuring a maximum fixed depth and retaining the datasonde if the line parted. Two-inch vent holes were drilled every 6 inches of the pipe and four two- by ten-inch-wide slots were cut in the bottom of the pipe to allow for circulation of water in the pipe and across the probes. An antifouling paint (Petit Trinidad SLR) was used to coat the last few meters of the PVC pipes, both inside and out, to retard biofouling and subsequent blockage of the holes/vents. A section of 4" copper pipe, vented as described above, was coupled to the lower end of some pipes, serving as an additional antifouling measure. A locking cap provided security.

In 2022, two methods of deployment and data collection were employed. The first being a stand-alone deployment during which a datasonde autonomously collected data on 15-minute intervals on Eastern Standard Time (EST) and record these data internally, to later be downloaded onto a desktop/laptop computer post-retrieval. This method was employed at stations jacb9wq, jacnewq, and jacbawq. The second method employed was the pairing of datasondes with telemetry equipment that received data from the datasondes and broadcast it to the GOES satellite for receipt by the NOAA Hydrometeorological Automated Data System (HADS) as well as an independent array at the NERRS CDMO. These data were also recorded independently every 15 minutes in Eastern Standard Time (EST) by the datasondes for redundancy and to continue with the pre-existing NERRS SOP. Such telemetry was employed at jacb6wq. For more detail concerning these telemetered datasonde stations, see below:

The Sutron Sat-Link2 transmitter was installed at this Buoy 126 (B6) on 06/22/06 and transmits data to the NOAA GOES satellite, NESDIS ID #3B00C264. 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.

The Sutron Sat-Link2 transmitter was installed at Chestnut Neck (NE) on 09/19/06 and transmits data to the NOAA GOES satellite, NESDIS ID #3B03E386. Telemetry was, however, not active at Chestnut Neck for this reporting period due to ongoing rebuilding of infrastructure. 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.

During each sampling period, measurements of specific conductance, salinity, temperature, dissolved oxygen, (percent saturation and concentration measured in mg/L), water level (depth), pH, and turbidity were recorded. After approximately 28 days datasondes were retrieved from the PVC pipe. Deployment periods were occasionally extended because of weather-related restrictions of access. An EXO2 datasonde attached to a hand-held display was then lowered to depth in order to sample in-situ water conditions at approximately the same depth at which data was recorded. A different calibrated and programmed YSI datasonde was then deployed to replace the datasonde being recovered. The recovered datasonde was brought back to the laboratory for downloading, post-deployment calibration checking, cleaning, and re-calibration.

Upon retrieval, datasondes were wrapped in a white towel and placed in a short section of PVC pipe for transport back to the laboratory. Datasondes were then placed in an aerated bucket of tap water overnight before post-processing according to SWMP standard operating procedures. Post-processing involves the placing of the un-cleaned datasonde in standards and recording of the displayed values, to judge how well the probes maintained calibration, determine the effect of bio-fouling (if any), and judge whether probe failure occurred during the deployment. After this post-deployment calibration check, probes were cleaned as per SWMP standard operating procedures and either re-calibrated for the next deployment or capped for storage for later calibration and deployment.

Datasondes were programmed to start recording data (ranging from one sample period to a few hours) before they were deployed in the field and allowed to run in either a wet, enclosed environment or an aerated water-filled bucket, so these deployment files often contained “tail ends” of non-deployment data, which were used to diagnose the probes but deleted before the data were processed for import into the yearly datasets. The beginning and end of each in-situ data file was compared to the handheld unit values and the data were checked for probe failure and fouling.

5) Site Location and Character

The Jacques Cousteau National Estuarine Research Reserve (JCNERR) at Mullica River/Great Bay is located on the northeast coast of the United States on the Atlantic Ocean. The estuary is near Tuckerton, New Jersey about 14 kilometers north of Atlantic City. There were four active sampling stations in 2022. All four locations can be characterized by having little macroalgae (few to no established beds in the immediate locale; seasonal and structurally-dependent fouling-type communities (macroalga, barnacles, shellfish, etc.) fast moving tidal currents, and tidal ranges of approximately 1m (although this can vary significantly depending on moon state, storm events, and coastal wind conditions (e.g.- “blow out tides” associated with strong offshore winds). All sites are in a relatively undisturbed area with minimal impact from development or pollution.

1) Buoy 126 (B6) - 39deg 30'28.44"N, 74 deg 20'18.67"W- located three kilometers from Little Egg Inlet on the eastern side of Great Bay and is 100 meters from the nearest land that is a natural marsh island. This is a naturally deep area that has never been dredged, but it is located about 0.5 kilometers from an area in the Intracoastal Waterway that is dredged regularly. The datasonde at this location is attached to Intracoastal Waterway Channel Marker 126 and is the closest monitoring station to Little Egg Inlet. This site can be characterized by having strong tidal currents, 2-3 knots, fine to course sand bottom with an extensive blue mussel bed surrounding the area. Groundwater inputs from margins of the estuary as well as surface flow from Mullica River account for the majority of freshwater coming into the system at this site, followed by input from rainwater from the marsh surface. Monitoring at this station began on 08/06/1996. In

2022, the reported temperature at this station ranged from -1.6°C to 28.0°C, with an average of 13.6°C. The reported salinity at this station ranged from 22.1psu to 32.6psu, with an average of 30.0psu. It is important to note that fouling may have occasionally depressed some salinity readings and are "flagged" as such in the dataset, so the aforementioned average and range may not be accurate. The maximum tidal range (including storm surge and drought-level data), as recorded by the datasonde, was 2.37m.

2) Buoy 139 (B9) – 39deg 29'52.59"N, 74deg 22'52.07"W*- is located 4 kilometers from Buoy 126 on the western side of Great Bay and is located about one to one and one-half kilometers from land. The datasonde at this location is attached to Intracoastal Waterway Channel Marker 139. The closest landform is an extensive salt marsh approximately 1.5 kilometers wide, which borders the upland area. This area is dredged by the U.S. Army Corp of Engineers approximately every five to six years to maintain the channel at a depth of approximately 2.5 meters. The surrounding depth of the bay is approximately 1.5 to 2 meters. This site is characterized by having maximum currents of about 1.5 knots with a muddy sand bottom and with little structure or shell. Groundwater inputs from margins of the estuary as well as surface flow from Mullica River account for the majority of freshwater coming into the system at this site, followed by input from rainwater from the marsh surface and above. Monitoring at this station began on 08/02/1996. In 2022, the reported temperature at this station ranged from -1.6°C to 29.7°C, with an average of 14.9°C. The reported salinity at this station ranged from 32.59psu to 49.53psu, with an average of 45.05psu. It is important to note that fouling may have occasionally depressed some salinity readings and are "flagged" as such in the dataset, so the aforementioned average and range may not be accurate. The maximum tidal range (including storm surge and drought-level data), as recorded by the datasonde, was 2.21m.

*= these coordinates are a correction to the location reported in years prior to 2018 metadata reports; the coordinates (39deg 29'24.65"N, 74 deg 22'53.83"W) of the #141 channel marker were incorrectly attributed to this (#139) channel marker, but the location of monitoring has remained consistent.

3) Chestnut Neck (NE) - 39deg 32'52.37"N, 74deg 27'38.77"W - located 12 kilometers up the Mullica River from the mouth of the river. The river begins at a line drawn between Graveling Point and Oysterbed Point on the northwestern side of Great Bay. The Mullica River at this location is quite wide, about 250 meters. The datasonde is attached to the dock of a small marina along the southern shore of the river adjacent to the main channel. This location has never been dredged. The site is characterized by having tidal currents of less then one knot, during both ebb and flood tide, and has a mixed organic mud/sand bottom. Freshwater input is primarily from groundwater and watershed runoff. Monitoring at this station began on 08/01/1996. In 2022, the reported temperature at this station ranged from -1.3°C to 30.5°C, with an average of 15.0°C. The reported salinity at this station ranged from 6.5psu to 28.7psu, with an average of 17.8psu. It is important to note that fouling may have occasionally depressed some salinity readings and are "flagged" as such in the dataset, so the aforementioned average

and range may not be accurate. The maximum tidal range (including storm surge and drought-level data), as recorded by the datasonde, was 2.28m.

4) Lower Bank (BA) - 39deg 35'37.18"N, 74 deg 33'05.44"W- located 13 kilometers upriver of the Chestnut Neck location. The Mullica River at this site is about two hundred meters wide. The datasonde is located at the center of a bridge spanning the Mullica River. The northern bank of the river is sparsely developed with single-family houses and has a steep bank about five meters high. The southern shore has an extensive marsh and fresh water wetland area about three kilometers wide. This site can be characterized by having fast tidal currents, just over one knot, deep water, and fine mixed organic mud and sandy sediment. Freshwater input is primarily from groundwater and watershed runoff. Monitoring at this station began on 10/10/1996. In 2022, the reported temperature at this station ranged from -0.5°C to 31.9°C, with an average of 15.4°C. The reported salinity at this station ranged from 0.0psu to 21.6psu, with an average of 4.7psu. It is important to note that fouling may have occasionally depressed some salinity readings and are "flagged" as such in the dataset, so the aforementioned average and range may not be accurate. The maximum tidal range (including storm surge and drought-level data), as recorded by the datasonde, was 2.09m.

Station Code	SWMP Status	Station Name	Location	Active Dates	Reason Decommissioned	Notes
B6	P	jacb6wq	39.50790, -74.33850	Aug 1996 - Present	NA	NA
B9	P	jacb9wq	39.49794, -74.38113	Aug 1996 - Dec 1998; May 2002- Present	NA	NA
NE	P	jacnewq	39.54790, -74.46080	Aug 1996 - Present	NA	NA
BA	P	jacbawq	39.59370, -74.55150	Oct 1996 - Present	NA	NA

6) Data Collection Period

Data collection at the JCNERR is often performed on a seasonal (rather than year-round) basis due to ice-over conditions in local waters and the damages associated with ice formation and movement. Typically, the target date for redeployment after the winter is mid-March, but is often earlier if conditions permit or later if winter conditions linger and/or stations are significantly damaged post-thaw. Datasondes are pulled and stations deactivated when ice-over conditions are anticipated (typically in early- or mid-December) in an attempt to avoid damage and/or loss of equipment due to the destructive nature of ice movements.

Site	Filename	Deploy Date	Time	Retrieve Date	Time
B6					
	jacb6wq122121	12/21/2021	10:30	02/02/2022	10:30
	jacb6wq020222	02/02/2022	11:00	03/10/2022	10:45
	jacb6wq031022	03/10/2022	15:45	04/25/2022	14:45
	jacb6wq042522	04/25/2022	15:00	06/15/2022	11:45
	jacb6wq061522	06/15/2022	12:00	07/21/2022	13:30
	jacb6wq072122	0721/2022	13:45	08/30/2022	10:15
	jacb6wq083022	08/30/2022	10:30	10/06/2022	13:00
	jacb6wq100622	10/06/2022	13:15	11/14/2022	14:45
	jacb6wq111422	11/14/2022	15:00	12/13/2022	14:30
	jacb6wq121322	12/13/2022	14:45	01/24/2022	14:15
B9					
	jacb9wq121421	12/14/2021	10:45	01/24/2022	14:45
	jacb9wq020922	02/09/2022	15:00	03/21/2022	12:30
	jacb9wq032222	03/22/2022	12:45	05/03/2022	12:15
	jacb9wq050322	05/03/2022	12:45	06/15/2022	12:00
	jacb6wq061522	06/15/2022	12:30	07/22/2022	10:30
	jacb9wq072222	07/22/2022	10:45	08/30/2022	10:30
	jacb9wq083022	08/30/2022	10:45	10/06/2022	13:15
	jacb9wq100622	10/06/2022	13:30	11/14/2022	15:00
	jacb9wq111422	11/14/2022	15:15	12/13/2022	14:45
	jacb9wq121322	12/13/2022	15:00	01/25/2022	11:00
NE					
	jacnewq112321	11/23/2021	12:15	01/12/2022	08:15
	jacnewq011222	01/12/2022	15:15	02/22/2022	11:00
	jacnewq022322	02/23/2022	10:15	03/28/2022	13:00
	jacnewq033022	03/30/2022	13:30	05/12/2022	11:45
	jacnewq051222	05/12/2022	12:00	06/24/2022	09:00
	jacnewq062422	06/24/2022	09:15	08/03/2022	14:15
	jacnewq080322	08/03/2022	14:30	09/08/2022	14:00
	jacnewq090822	09/08/2022	14:15	10/19/2022	11:00
	jacnewq101922	10/19/2022	11:15	12/01/2022	11:30
	jacnewq120122	12/01/2022	11:45	01/16/2022	14:45
BA					
	jacbawq113021	11/30/2021	13:30	01/12/2022	15:45
	jacbawq011322	01/13/2022	13:00	02/28/2022	10:30
	jacbawq030122	03/01/2022	15:15	04/11/2022	13:00
	jacbawq041322	04/13/2022	13:30	05/18/2022	10:15
	jacbawq051822	05/18/2022	10:30	06/30/2022	10:15
	jacbawq063022	06/30/2022	10:30	08/03/2022	15:00

jacbawq080322	08/03/2022	15:15	09/08/2022	14:30
jacbawq090822	09/08/2022	16:30	10/20/2022	09:30
jacbawq102022	10/20/2022	09:45	12/01/2022	12:00
jacbawq120122	12/01/2022	12:15	01/17/2022	11:45

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 processed the data. Following academic courtesy standards, the NERR site where the data were collected should be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government does not assume liability to the Recipient or third persons, nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

Requested citation format:
NOAA National Estuarine Research Reserve System (NERRS). System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: http://www.nerrsdata.org/; *accessed* 12 October 2022.

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 comma delimited format.

8) Associated Researchers and Projects

As per the requisites of the national SWMP program, the JCNERR performs nutrient sampling and meteorological monitoring correlated with the water-quality data addressed in this report. Data can be accessed by visiting www.nerrsdata.org

During 2022, weekly ichthyoplankton sampling at Little Sheepshead Creek Bridge (LSCB) continued as part of the long-term sampling conducted by the Rutgers University Marine Field Station (RUMFS) in the Jacques Cousteau National Estuarine Research Reserve (JCNERR). Presence and abundance of larval fishes are determined with a plankton net (1m, 1mm mesh) deployed during night flood tides from a bridge near Little Egg Inlet (New Jersey) in the Great Bay/Little Egg harbor portion of the JCNERR.

RUMFS conducts annual trawl survey at numerous sites from offshore of Little Egg Inlet to the freshwater interface up the Mullica River ("Mullica River-Great Bay Estuary"). SWMP data are regularly used in the analysis of community composition and species assemblage.

The aforementioned trawl surveys, which rely on the physical water quality data collected through SWMP, are also incorporated as control for another set of surveys tracking the effects of the decommissioning of the Oyster Creek Nuclear Generating Station in Lacey, NJ.

A wire-mesh trapping survey of fish and crustaceans conducted by RUMFS within the RUMFS boat basin also continued in 2022 as part of long-term sampling within the Reserve.

Dr. Mark Sullivan's class at Stockton University has extensively utilized the JCNERR's SWMP dataset, including WQ data, in their curriculum.

Dr. Paul Jivoff of Rider University conducts regular surveys of local crab populations and utilizes the SWMP dataset.

Over-wintering populations of seals near the B6 site were observed/studied over the winter of 2021-2022 and 2022-2023 as a joint Rutgers University/Stockton College program; SWMP data from B6 are utilized in these observations/study.

II. Physical Structure Descriptors

9) Sensor Specifications

YSI EXO2 Sonde:

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Wiped probe; Thermistor
Model#: 599827
Range: -5 to 50 C
Accuracy: ±0.2 C
Resolution: 0.001 C

Parameter: Conductivity
Units: milli-Siemens per cm (mS/cm)
Sensor Type: Wiped probe; 4-electrode cell with autoranging
Model#: 599827
Range: 0 to 100 mS/cm
Accuracy: ±1% of the reading or 0.002 mS/cm, whichever is greater
Resolution: 0.0001 to 0.01 mS/cm (range dependent)

Parameter: Salinity
Units: practical salinity units (psu)/parts per thousand (ppt)
Model#: 599827
Sensor Type: Wiped probe; Calculated from conductivity and temperature
Range: 0 to 70 ppt
Accuracy: ±2% of the reading or 0.2 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 (0.04 m)
Resolution: 0.001 ft (0.001 m)

Parameter: pH
Units: pH units
Sensor Type: Glass combination electrode
Model#: 599702
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

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.

10) Coded Variable Definitions

Sampling Station:	Sampling Site Code	Station Code
Buoy 126	B6	jacb6wq
Buoy 139	B9	jacb9wq
Lower Bank	BA	jacbawq
Chestnut Neck	NE	jacnewq

jac = three-letter abbreviation for the Jacques Cousteau National Estuarine Research Reserve

wq = water quality data

example 1: jacb6wq040722= this demonstrates the naming convention for deployment files. This denotes a deployment at the Jacques Cousteau National Estuarine Research Reserve's (jac) Buoy 126 (b6) water quality (wq) station starting on 04/07/2022.

example 2: jacb6wq2022= water quality dataset from the JCNERR's Buoy 126 station for the year 2022

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
SCS Chlorophyll spike
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

Deployment filename Datasonde ID#, Dissolved Oxygen #1 depth measured/expected offset, Specific Conductivity, pH7, pH10, Turbidity0

Deployment Name	Sonde Name	DO 100%	Depth m (measured/ expected)	SpCond 10mS/cm3	pH (7)	pH (10)	Turb 0NTU
jacb6wq122121	Mr. Blonde	101.9	0.162/0.139	10.0636	7.12	10.21	0.55

jacb6wq020222	Mr. Pink	99.1	-0.053/0.068	9.9523	7.12	10.19	0.21
jacb6wq031022	Mr. Pink	100.1	-0.0040/-0.016	10.0659	7.03	10.16	0.42
jacb6wq042522	Boss Joe	95.6	0.079/0.078	10.0448	7.14	10.16	4.02
jacb6wq061522	Nice Guy Eddie	101.1	-0.006/-0.003	9.9944	7.15	10.14	0.33
jacb6wq072122	Mr. Pink	91.4	-0.028/-0.003	10.0206	7.06	10.02	1.09
jacb6wq083022	Mr. Blonde	96.0	0.011/0.017	9.9726	7.10	10.09	0.34
jacb6wq100622	Nice Guy Eddie	99.7	0.206/0.139	10.080	7.10	10.16	0.64
jacb6wq111422	Mr. Pink	99.5	0.266/0.068	10.026	7.12	10.14	0.18
jacb6wq121322	Mr. White	100.7	-0.008/0.119	9.993	7.05	10.10	-0.08
jacb9wq121421	Mr. Pink	98.7	-0.021/-0.031	9.9999	7.06	10.11	0.21
jacb9wq020922	Mr. Blonde	99.5	0.028/0.068	9.9784	7.25	10.31	0.35
jacb9wq032222	Mr. Blonde	100.2	0.09/0.088	10.0136	7.10	10.14	0.15
jacb9wq050322	Newbie	95.4	0.079/0.068	9.9845	7.07	10.11	3.56
jacb9wq061522	Mr. Blue	102.9	-0.055/-0.003	9.9903	7.12	10.09	0.36
jacb9wq072222	Mr. Blonde	94.5	-0.027/-0.003	10.0131	7.06	10.01	0.72
jacb9wq083022	Newbie	100.8	0.02/0.017	9.9902	6.97	10.02	0.54
jacb9wq100622	Mr. Blue	99.6	0.272/0.139	10.051	7.11	10.15	1.74
jacb9wq111422	Mr. Blonde	99.5	0.266/0.078	10.067	7.07	10.16	0.21
jacb9wq121322	Boss Joe	100.7	0.111/0.119	9.967	7.00	9.95	0.25
jacnewq112321	Nice Guy Eddie	102.1	0.086/0.083	9.9133	7.09	10.15	0.51
jacnewq011122	Nice Guy Eddie	101.4	0.061/0.073	9.9912	7.20	10.24	0.14
jacnewq022322	Nice Guy Eddie	103.8	0.044/-0.014	10.179	7.05	10.22	0.22
jacnewq033022	Nice Guy Eddie	101.5	-0.032/-0.084	9.9642	7.10	10.17	1.06
jacnewq051222	Mr. Blonde	104.8	0.051/0.099	9.5216	7.07	10.11	0.30
jacnewq062422	Newbie	101.3	0.059/0.033	9.9928	7.10	10.13	3.9
jacnewq080322	Nice Guy Eddie	99.8	0.099/0.017	10.018	7.09	10.018	0.12
jacnewq090822	Mr. Pink	99.2	0.049/0.037	10.034	7.06	10.12	2.65
jacnewq101922	Newbie	101.2	0.212/0.160	10.053	7.12	10.06	0.06
jacnewq120122	Mr. Blue	100.1	0.307/-0.117	10.160	7.10	10.18	0.13
jacbawq113021	Mr. Blue	100.9	0.095/0042	10.0153	7.03	10.10	0.70
jacbawq011322	Mr. Blue	101.1	0.147/0.099	9.9884	7.14	10.23	1.02
jacbawq030122	Mr. Blue	100.2	0.068/0.037	10.0878	7.07	10.16	0.09
jacbawq041322	Mr. Blue	98.7	-0.194/-0.068	9.9548	7.08	10.13	1.3
jacbawq051822	Mr. Pink	100.1	0.073/0.068	9.9485	7.13	10.12	0.26
jacbawq063022	Boss Joe	102.3	0.058/0.033	10.0105	7.16	10.16	4.72
jacbawq080322	Mr. Blue	100.7	0.334/0.017	10.053	7.09	10.09	0.07
jacbawq090822	Mr. Blonde	100.4	0.045/0.037	10.058	7.09	10.08	1.90
jacbawq102022	Boss Joe	98.6	0.113/0.139	10.003	7.08	10.09	0.21
jacbawq120122	Nice Guy Eddie	101.0	0.106/-0.117	10.182	7.10	10.23	0.13

14) Other Remarks/Notes

This section details comments concerning data in the data set that are not adequately described by the coding convention or require additional comment/qualification.

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. Occasionally, supplementary data are available from proximal non-SWMP stations. If additional information and/or missing data are needed, contact the Research Coordinator at the reserve submitting the data.

Occasionally negative turbidity values between -0001 and -0002 NTU's/FNU's are recorded. Because such values fall within the range of accuracy (+/-2 NTU/FNU) of the 6-series turbidity probes, these data are considered suspect but not rejected.

Occasionally negative turbidity values less than -0002NTU's/FNU's are recorded. Because such values fall outside the range of accuracy (+/-2 NTU/FNU) of the 6-series turbidity probes, these data were rejected and flagged with a <-3> <SNV> (negative value) designation in the dataset.

Note to users: When utilizing these data, it is always best to also review the SWMP Meteorological (MET) dataset from this reserve to provide weather conditions that may affect the SWMP Water Quality (WQ) data from this reserve. For example, strong precipitation and strong sustained winds may cause elevations in turbidity and alter dissolved oxygen levels. Periods of drought may alter salinity patterns and lead to anoxic conditions in poorly-circulated regions of reserve waters. Hurricane and Nor'easter events may alter WQ parameters in the above, and other, manners. Provisional MET data from the JCNERR's MET station (station code: jacncmet) are available at the CDMO website: http://nerrsdata.org/

All stations:

There are a number of instances where data are missing between sonde deployments due to a combination of sensors "aging out" and failing (particularly the optical dissolved oxygen probes and central wipers) and COVID-related "supply chain shortages", leaving the reserve short on sondes to immediately replace retrieved sondes. Therefore, many successive deployments are re-calibrations of the same sonde deployed during the prior, resulting in gaps in the dataset. These periods are denoted with a "<-2> GMC" flag code in the datasets.

B6

The central wiper bristles were lost during the jacb6wq042522 deployment, which resulted in fouling of multiple sensors with variable timing.

The jacb6042522 went over the 6-week deployment length allowed by the NERRS SOPs ending on 06/15/2022. While data appear impacted they were in the water longer than the SOPs allow for.

At the following dates and times SpCond and salinity data were impacted by potential fouling on the sonde and conductivity probe. This fouling due to being intermittent may have been caused by a motile organism.

8/5 5:15
8/18 13:00
8/24 00:45

B9

From 05/24/2022 12:45 - 06/07/2022 22:30 SpCond and salinity data may have been impacted by a wiper malfunction or fouling. The potential fouling on the sonde and conductivity probe may have been caused by a motile species.

NE

Depth data during the jacnewq12012022 deployment are disjunct at both the deployment and retrieval. We believe this may have been a calibration issue however the sonde calibrated ok. The pre-calibration value read -0.296 but calibrated to the depth offset of -0.044. At the post the sonde read 0.307 for a depth offset of -0.177. Due to this inconsistency at the post we have marked depth values 1 SPC CSM for this deployment.

BA

None