**North Carolina** (NOC) **NERR Water Quality Metadata**
**January 1, 2018 – December, 2018**
**Latest Update**: **June 30, 2020**

## I. Data Set and Research Descriptors

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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 EcoWatch in a comma-delimited format (.CDF), EcoWatch Lite in a comma separated file (CSV) or 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. All QA/QC by the Reserve are performed by Heather Wells and Byron Toothman.

**3) Research objectives –**

Four long-term water quality monitoring stations have been established within the estuaries bordering Masonboro and Zeke's Islands of North Carolina's National Estuarine Research Reserve. Instruments are deployed vertically at all sites except East Cribbings, which was anchored to the bottom for the majority of 2012. The East Cribbings site was converted to a vertical deployment structure on December 4, 2012. Measurements are taken at 15-minute intervals for approximately two to four week periods continuously throughout the year. Parameters measured include Depth, Temperature, Salinity, Specific Conductivity, pH, Dissolved Oxygen, and Turbidity. The goal is to assess short-term variability and long-term changes (i.e., localized impacts of seasonal storm events, inter-annual differences from rainfall, magnitude of climatic influence from El Nino/La Nina events, etc.) in estuarine water parameters within relatively pristine sites.

**4) Research methods –**

The Estuarine Water Quality Monitoring Program began on March 2, 1992 at the Research Creek site of the Masonboro Island component. A second Masonboro Island site, Loosin Creek, was added on February 26, 2002. Data collection started on May 19, 1994 at the Zeke's Island component (East Cribbings site) and an additional site, Zeke's Basin, was added March 1, 2002. The procedures described below were instituted in June 1995 and thus do not cover data recorded previously.

Two data loggers are assigned to each of the four permanent monitoring stations and are generally not interchanged among sites unless malfunctions occur. Before each YSI EXO2 or YSI 6600EDS sonde is deployed, calibration and maintenance is performed following the manufacturer's instructions. Calibration standards are required for pH, turbidity and salinity; all other parameter calibrations are performed as described in the manual. Buffer solutions for a two-point pH calibration (pH 7 and 10) are purchased pre-made from a scientific supply house. The conductivity and turbidity standards are obtained from YSI. Chlorophyll probes are calibrated with deionized water as single point calibration. The optical dissolved oxygen probes (ROX) require membrane changes yearly unless scratches or malfunctions occur prior to that time. All sites have been monitored using ROX dissolved oxygen probes since 2009, prior to that time rapid pulse dissolved oxygen probes were used. The rapid pulse membranes were replaced prior to each deployment and allowed to equilibrate prior to calibration.

Data sondes are wrapped in a wet, white towel and placed in a cooler for transport to the site. Monitoring stations are accessed using a small boat equipped with an outboard motor. During deployment the weather conditions and tide stage are recorded in the field observation log. The water quality instrument is placed inside a locked PVC tube that is attached to a piling if vertical deployment, and a steel cage if anchored horizontally approximately (15cm off the bottom). Every 15 minutes measurements are taken for Temperature, Specific Conductance, Salinity, Dissolved oxygen saturation, Dissolved oxygen concentration, Depth, pH, and Turbidity. All data are recorded in Eastern Standard Time. Vertical deployment structures were utilized at Research Creek beginning in 2008-2009, at Loosin Creek in 2009, and at Zeke's Basin in August 2010.

During 2018, chlorophyll data was collected at East Cribbings, Loosin Creek, and Research Creek stations. A one point (0 NTU) chlorophyll calibration using DI water was performed prior to sonde deployments. Chlorophyll spikes and negative values were rejected, while elevated values may be flagged as suspect depending on field conditions. We do not currently calibrate with a known concentration of phytoplankton from fluorometric analysis, Rhodamine solutions, or adjust the data with any correction.

At the end of the sample period the water quality instrument is exchanged with a freshly calibrated instrument and transported back to the laboratory wrapped in a wet, white towel. The weather and water quality measurements are again noted in the field observation log. The calibration drift and the effect of biofouling on the water quality instrument are documented by post-calibration protocols. The water quality data are then uploaded, and sent to CDMO for primary QAQC, and the instrument is cleaned and calibrated as noted

previously.

A Sutron Sat-Link2 transmitter was installed at the Research Creek station on August 7, 2006, and at the Zeke's Basin station on November 3, 2008. Both transmit data to the NOAA GOES satellite, NESDIS ID #3B032698. 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.

**5) Site location and character –**

The components of North Carolina's National Estuarine Research Reserve (from north to south) are: Currituck Banks, Rachel Carson, Masonboro Island, and Zeke's Island. They are located along the southeast Atlantic coast of the United States. Currently, only data from Masonboro Island and Zeke's Island components are transferred to the CDMO. The four monitoring sites are:

**A.** Research Creek, Masonboro Island
The first Masonboro Island site (formerly called Masonboro Island (MS)) is 0.72 km north east from the mouth of Whiskey Creek, and east of the Intracoastal Waterway (ICW), in a small navigable channel called Research Creek at 34°09'21.7" latitude and 77° 50'59.9" longitude. The site typically has a salinity range of 20-35 ppt and a tidal range that averages around 1.2 meters. The sole source of freshwater is rain and salinity values as little as 10 ppt have been recorded during periods of heavy rain. The creek bottom is characterized by sand and detritus based sediment with areas of soft mud with a depth ranging from 0.2 to 2.6 m. Spartina spp. marsh and dunes surround the site, which is relatively unimpacted by manmade perturbations and it is not accessible to road traffic. The site experiences minimal boat traffic.

**B.** Loosin Creek, Masonboro Island
The second Masonboro Island site (added in 2002) is 1.2 km east of the ICW, and 2.5 km south west of Masonboro Inlet, in a small navigable channel called Loosin Creek at 34° 10'20.0" latitude and 77° 49'58.1" longitude. The site generally has a salinity range of 22-35 ppt and a tidal range that averages 1.2 meters. The sole source of freshwater is rain and salinity values as little as 15 ppt have been recorded during periods of heavy rain. The creek bottom is characterized by sand and detritus based sediment with areas of soft mud with a depth ranging from 0.1 to 2.5 m. Spartina spp. marsh and dunes surround the site, which is relatively unimpacted by manmade perturbations and it is not accessible to road traffic. The site experiences minimal boat traffic.

**C.** East Cribbings, Zeke's Island
The first Zeke's Island site (formerly called Zeke's Island (ZI)) is located 1.8 km south of Federal Point boat launch in a tidal basin estuary at 33° 56'23.5" latitude and 77° 56'28.1" longitude. This site receives minimal freshwater input from leakage of the Cape Fear River through the 5.6 km rock jetty that separates the two bodies of water. The site typically has a salinity range of 15-33 ppt, although values as little as 10 ppt have been recorded. Tidal range averages 1.2 meters. Depth varies, but usually can be found to range from 0.5 to 2.7 meters. Bottom type substratum consists of large rocks ("the cribbings") with sand and detritus based sediment. There are no pollutants from land. Marsh and dunes surround the site. It is not accessible to road traffic but experiences minimal boat traffic.

**D.** Zeke's Basin, Zeke's Island
The second Zeke's Island site (added in 2002) is located 0.8 km south east of the Federal Point boat launch in a tidal basin estuary at 33° 57'17.0" latitude and 77° 56'6.0" longitude. This site receives minimal freshwater input from leakage of the Cape Fear River through the 5.6 km rock jetty that separates the two bodies of water The site has a characteristic salinity range of 12-30 ppt, but values below 10 ppt have been observed and are often associated with periods of heavy rainfall. Tidal range averages 1.2 meters. Depth varies, but typically

it can be found to range from 0.1 to 1.8 meters. Bottom type substratum consists of sand and detritus based sediment with a layer of soft sulfuric mud. Marsh and dunes surround the site. It is not accessible to road traffic but experiences minimal boat traffic.

SWMP Station Timeline

| Station Code | SWMP Status | Station Name | Location | Active Dates | Reason Decommissioned | Notes |
|---|---|---|---|---|---|---|
| NOCECWQ | P | East Cribbing | 33° 56' 23.64 N, 77° 56' 27.96 W | 01/01/2002 00:00 - | NA | NA |
| NOCLCWQ | P | Loosin Creek | 34° 10' 19.92 N, 77° 49' 58.08 W | 02/01/2002 00:00 - | NA | NA |
| NOCRCWQ | P | Research Creek | 34° 9' 21.60 N, 77° 50' 59.64 W | 01/01/2002 00:00 - | NA | NA |
| NOCZBWQ | P | Zeke's Basin | 33° 57' 16.92 N, 77° 56' 6.00 W | 03/01/2002 00:00 - | NA | NA |

**6) Data collection period –**

| East Cribbing | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Model Numbers | | | | | |
| Deploy Date | Deploy Time | Retrieve Date | Retrieve Time | Sonde (Nickname) | pH | DO | Turb | Cond | Chloro |
| 12/4/2017 | 12:00 | 1/17/2018 | 12:45 | EXO2 (#3) | 599702 | 599100 | 599101 | 599870 | 599103 |
| 1/17/2018 | 13:00 | 2/6/2018 | 13:30 | EXO2 (#1) | 599702 | 599100 | 599101 | 599870 | 599103 |
| 2/6/2018 | 13:45 | 3/20/2018 | 13:30 | EXO2 (#3) | 599702 | 599100 | 599101 | 599870 | 599103 |
| 3/20/2018 | 13:45 | 5/3/2018 | 10:45 | EXO2 (#1) | 599702 | 599100 | 599101 | 599870 | 599103 |
| 5/3/2018 | 11:00 | 5/30/2018 | 12:45 | EXO2 (#3) | 599702 | 599100 | 599101 | 599870 | 599103 |
| 5/30/2018 | 13:00 | 7/2/2018 | 13:15 | EXO2 (#1) | 599702 | 599100 | 599101 | 599870 | 599103 |
| 7/2/2018 | 13:45 | 7/31/2018 | 13:00 | EXO2 (#3) | 599702 | 599100 | 599101 | 599870 | 599103 |
| 7/31/2018 | 13:30 | 8/28/2018 | 10:15 | EXO2 (#1) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 8/28/2018 | 10:30 | 10/9/2018 | 11:00 | EXO2 (#3) | 599702 | 599100 | 599101 | 599870 | 599103 |
| 10/9/2018 | 11:15 | 11/13/2018 | 15:15 | EXO2 (#1) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 11/13/2018 | 15:30 | 12/12/2018 | 13:00 | EXO2 (#3) | 599702 | 599100 | 599101 | 599870 | 599103 |
| 12/12/2018 | 13:15 | 1/9/2019 | 14:45 | EXO2 (#1) | 599702 | 599100 | 599101 | 599827 | 599103 |

| Loosin Creek | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Model Numbers | | | | | |
| Deploy Date | Deploy Time | Retrieve Date | Retrieve Time | Sonde (Nickname) | pH | DO | Turb | Cond | Chloro |
| 12/4/2017 | 10:45 | 1/17/2018 | 10:15 | EXO2 (#2) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 1/17/2018 | 10:30 | 2/6/2018 | 11:45 | EXO2 (#4) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 2/6/2018 | 12:15 | 3/20/2018 | 11:30 | EXO2 (#2) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 3/20/2018 | 11:45 | 5/2/2018 | 9:45 | EXO2 (#4) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 5/2/2018 | 10:15 | 5/30/2018 | 9:15 | EXO2 (#2) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 5/30/2018 | 9:30 | 7/2/2018 | 11:45 | EXO2 (#4) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 7/2/2018 | 12:00 | 8/1/2018 | 11:45 | EXO2 (#2) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 8/1/2018 | 12:00 | 8/29/2018 | 10:15 | EXO2 (#4) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 8/29/2018 | 10:30 | 9/10/2018 | 8:30 | EXO2 (#2) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 10/3/2018 | 14:15 | 11/13/2018 | 12:30 | EXO2 (#4) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 11/13/2018 | 12:45 | 12/11/2018 | 11:30 | EXO2 (#2) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 12/11/2018 | 12:00 | 1/9/2019 | 13:45 | EXO2 (#4) | 599702 | 599100 | 599101 | 599827 | 599103 |

| Research Creek | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Model Numbers | | | | | |
| Deploy Date | Deploy Time | Retrieve Date | Retrieve Time | Sonde (Nickname) | pH | DO | Turb | Cond | Chloro |
| 12/4/2017 | 10:30 | 1/17/2018 | 5:45 | EXO2 (#6) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 1/17/2018 | 6:00 | 2/6/2018 | 11:30 | EXO2 (#5) | 599702 | 599100 | 599101 | 599870 | 599102 |
| 2/6/2018 | 11:45 | 3/20/2018 | 11:15 | EXO2 (RC #6) | | 599100 | 599101 | 599827 | 599102 |
| 3/20/2018 | 11:30 | 5/2/2018 | 10:15 | EXO2 (#5) | 599702 | 599100 | 599101 | 599870 | 599102 |
| 5/2/2018 | 10:30 | 5/30/2018 | 9:00 | EXO2 (RC #6) | 599702 | 599100 | 599101 | 599827 | 599102 |
| 5/30/2018 | 9:30 | 7/2/2018 | 11:30 | EXO2 (#9) | 599702 | 599100 | 599101 | 599827 | 599102 |
| 7/2/2018 | 11:45 | 8/1/2018 | 11:30 | EXO2 (RC #6) | 599702 | 599100 | 599101 | 599827 | 599102 |
| 8/1/2018 | 11:45 | 8/29/2018 | 10:45 | EXO2 (#9) | 599702 | 599100 | 599101 | 599827 | 599102 |
| 8/29/2018 | 11:00 | 10/3/2018 | 14:00 | EXO2 (RC #5) | 599702 | 599100 | 599101 | 599827 | 599102 |
| 10/4/2018 | 14:30 | 11/13/2018 | 12:15 | EXO2 (RC #9) | | | | | |
| 11/13/2018 | 12:30 | 12/11/2018 | 11:15 | EXO2 (RC #5) | 599702 | 599100 | 599101 | 599827 | 599102 |
| 12/11/2018 | 11:30 | 1/9/2019 | 13:30 | EXO2 (#9) | 599702 | 599100 | 599101 | 599827 | 599102 |

| Zeke's Basin | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Model Numbers | | | | | |
| Deploy Date | Deploy Time | Retrieve Date | Retrieve Time | Sonde (Nickname) | pH | DO | Turb | Cond | Chloro |
| 12/4/2017 | 12:15 | 1/17/2018 | 12:45 | EXO2 (#8) | 599702 | 599100 | 599101 | 599827 | n/a |
| 1/17/2018 | 13:00 | 2/6/2018 | 13:45 | EXO2 (#7) | 59972 | 599100 | 599101-01 | 599870 | |
| 2/6/2018 | 14:00 | 3/20/2018 | 14:00 | EXO2 (#8) | 599702 | 599100 | 599101 | 599827 | n/a |
| 3/20/2018 | 14:15 | 5/3/2018 | 11:00 | EXO2 (#7) | 59972 | 599100 | 599101 | 599870 | n/a |
| 5/3/2018 | 11:15 | 5/29/2018 | 10:15 | EXO2 (#8) | 599702 | 599100 | 599101 | 599827 | n/a |
| 5/29/2018 | 10:30 | 7/2/2018 | 13:30 | EXO2 (#7) | 59972 | 599100 | 599101 | 599870 | |
| 7/2/2018 | 13:45 | 7/31/2018 | 13:30 | EXO2 (#8) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 7/31/2018 | 13:45 | 8/28/2018 | 10:30 | EXO2 (#7) | 59972 | 599100 | 599101 | 599870 | 599103 |
| 8/28/2018 | 10:45 | 10/9/2018 | 11:15 | EXO2 (#8) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 10/9/2018 | 11:30 | 11/13/2018 | 15:15 | EXO2 (#7) | 59972 | 599100 | 599101 | 599870 | 599103 |
| 11/13/2018 | 15:45 | 12/12/2018 | 13:15 | EXO2 (#8) | 599702 | 599100 | 599101 | 599827 | 599103 |
| 12/12/2018 | 13:30 | 1/9/2019 | 15:15 | EXO2 (RC #5) | 599702 | 599100 | 599101 | 599827 | 599102 |

**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:
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 2018.

Also include the following excerpt in the metadata which will address how and where the data can be obtained.

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** (link to other products or programs) **–**

As part of the SWMP core monitoring program, the North Carolina Reserve also collects weather data from a meteorological station located at the Research Creek monitoring site and water chemistry/nutrient data from all 4 of the water quality monitoring sites. These data may be correlated with this water quality dataset. These data are available at www.nerrsdata.org.

Additional research projects are ongoing and continually changing. Check with the Research Coordinator or other contact person for an updated list of research.

## II. Physical Structure Descriptors

**9) Sensor specifications –**

NOC NERR deployed Xylem Analytics EXO data sondes at all sites in 2018. All sondes used are the same model (EXO2) and employ the same sensor configuration except Zeke's Basin which lacked chlorophyll sensors until May 29, 2018. From that point forward, all stations collect chlorophyll data.

YSI EXO Sonde:

Parameter: Temperature
Units: Celsius (C)
Sensor Type: CT2 Probe, Thermistor
Model#: 599870
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: CT2 Probe, 4-electrode cell with autoranging
Model#: 599870
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: CT2 probe, 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

OR

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 (0.004 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: +/- 0.1 units within +/- 10° of calibration temperature, +/- 0.2 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: |
|---|---|---|
| Research Creek | RC | nocrcwq |
| Loosin Creek | LC | noclcwq |
| East Cribbings | EC | nocecwq |
| Zeke's Basin | ZB | noczbwq |

**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 –**

| East Cribbings | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Deploy Date | Sonde | SpCond | DO | pH7 | pH10 | Turb | Depth | CHL(0) |
| 1/17/2018 | #1 | 49.29(50.0) | 100.8 | 7.20 | 10.14 | -1.02(0.0) | 0.077(0.131) | -0.07 |
| 2/6/2018 | #3 | 50.13(50.0) | 98.9 | 7.14 | 10.08 | 1.7(0.0) | 0.025(0.027) | 0.16 |
| 3/20/2018 | #1 | 42.8(50.0) | 110.0 | 7.50 | 10.17 | 0.26(0.0) | 0.044(0.038) | 0.06 |
| 5/3/2018 | #3 | 50.32(50.0) | 100.2 | 6.96 | 9.87 | 0.29(0.0) | 0.0020(0.0060) | -0.12 |
| 5/30/2018 | #1 | 15.16(50.0) | 92.0 | 7.36 | 10.29 | 0.83(0.0) | 0.06(0.0) | 0.34 |
| 7/2/2018 | #3 | 49.9(50.0) | 56.1 | 7.22 | 10.11 | 97.74(0.0) | -0.0020(-0.014) | 14.72 |
| 7/31/2018 | #1 | 50.37(50.0) | 100.6 | 7.10 | 10.06 | 0.43(0.0) | 0.084(0.079) | -0.22 |
| 8/28/2018 | #3 | 49.44(50.0) | 99.3 | 6.94 | 10.00 | 12.43(0.0) | 0.125(0.12) | 0.00 |
| 10/9/2018 | #1 | 50.97(50.0) | 101.7 | 7.42 | 10.40 | 0.06(0.0) | 0.139(0.141) | -0.30 |
| 11/13/2018 | #3 | 50.34(50.0) | 101.1 | 7.18 | 10.01 | 0.19(0.0) | 0.07(0.079) | -0.09 |
| 12/12/2018 | #1 | 48.8(50.0) | 100.3 | 7.06 | 10.00 | 0.67(0.0) | 0.06(0.058) | 0.10 |

| Loosin Creek | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Deploy Date | Sonde | SpCond | DO | pH7 | pH10 | Turb | Depth | CHL(0) |
| 1/17/2018 | #4 | 50.85(50.0) | 98.6 | 7.03 | 10.06 | 0.37(0.0) | -0.026(0.0) | 0.02 |
| 2/6/2018 | #2 | 50.63(50.0) | 98.6 | 7.00 | 9.97 | 1.3(0.0) | 760.476(0.0) | 0.07 |
| 3/20/2018 | #4 | 45.06(50.0) | 98.5 | 7.53 | 10.11 | 0.88(0.0) | 0.037(0.038) | 0.08 |
| 5/2/2018 | #2 | 51.85(50.0) | 98.8 | 7.06 | 9.94 | 0.21(0.0) | 0.0050(0.0060) | -0.10 |
| 5/30/2018 | #4 | 50.51(50.0) | 102.8 | 7.27 | 9.58 | -0.54(0.0) | 0.057(0.0) | 0.26 |
| 7/2/2018 | #2 | 51.06(50.0) | 99.1 | 7.14 | 9.99 | 2.68(0.0) | -0.029(-0.014) | 0.62 |
| 8/1/2018 | #4 | 48.46(50.0) | 99.6 | 7.24 | 10.11 | 0.0(0.0) | 0.048(-0.025) | 0.05 |
| 8/29/2018 | #2 | 50.8688(50.0) | 100.3 | 7.18 | 10.05 | 0.17(0.0) | 0.039(0.131) | 0.01 |
| 10/3/2018 | #4 | 45.34(50.0) | 98.5 | 6.95 | 9.98 | 0.93(0.0) | 0.163(-9.285) | -0.01 |
| 11/13/2018 | #2 | 50.54(50.0) | 99.7 | 7.58 | 10.46 | 0.08(0.0) | 0.041(0.027) | -0.41 |
| 12/10/2018 | #4 | 49.15(50.0) | 100.6 | 7.70 | 10.08 | 0.19(0.0) | 0.065(0.058) | 0.07 |

| Research Creek | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Deploy Date | Sonde | SpCond | DO | pH7 | pH10 | Turb | Depth | CHL(0) |
| 1/17/2018 | #5 | 51.76(50.0) | 100.9 | 6.94 | 9.93 | 0.41(0.0) | 0.0010(0.131) | 0.57 |
| 2/6/2018 | #6 | 49.54(50.0) | 98.0 | 7.02 | 10.00 | 0.18(0.0) | -0.0020(0.0060) | -0.33 |
| 3/20/2018 | #5 | n/a | 99.6 | 7.09 | 10.06 | 0.82(0.0) | 0.039(0.0) | 0.19 |
| 5/2/2018 | #6 | 50.98(50.0) | 100.7 | 7.07 | 10.06 | -0.17(0.0) | 0.027(0.0060) | -0.04 |
| 5/30/2018 | #9 | 0.01(50.0) | 84.9 | 7.09 | 10.01 | 0.14(0.0) | 0.056(0.0) | 0.35 |
| 7/2/2018 | #6 | 50.84(50.0) | 100.3 | 7.07 | 10.06 | 0.027(0.0) | 0.0090(-0.014) | 0.09 |
| 8/1/2018 | #9 | 0.241(50.0) | 99.1 | 6.85 | 9.87 | 0.78(0.0) | 0.046(-0.025) | 0.46 |
| 8/29/2018 | #6 | 51.34(50.0) | 100.6 | 7.13 | 9.93 | 0.46(0.0) | 0.573(0.048) | -0.16 |
| 10/4/2018 | #9 | 0.01(50.0) | 101.4 | 7.13 | 9.97 | 4.3(0.0) | 0.14(0.141) | 1.80 |
| 11/13/2018 | #6 | 50.76(50.0) | 100.5 | 6.90 | 9.78 | 0.01(0.0) | 0.047(0.027) | 0.52 |
| 12/11/2018 | #9 | 0.0(50.0) | 96.6 | 6.75 | 9.70 | -0.68(0.0) | 0.067(0.048) | -0.50 |

| Zeke's Basin | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Deploy Date | Sonde | SpCond | DO | pH7 | pH10 | Turb | Depth | CHL(0) |
| 1/17/2018 | #7 | 53.35(50.0) | 99.7 | 7.21 | 10.20 | 0.39(0.0) | 0.057(0.089) | n/a |
| 2/6/2018 | #8 | 50.51(50.0) | 98.1 | 6.80 | 9.80 | 0.83(0.0) | -0.016(0.0060) | n/a |
| 3/20/2018 | #7 | 48.05(50.0) | 100.6 | 7.03 | 10.06 | -0.31(0.0) | 0.048(0.038) | n/a |
| 5/3/2018 | #8 | 50.78(50.0) | 99.3 | 7.00 | 10.14 | -0.9(0.0) | -0.057(-0.052) | n/a |
| 5/29/2018 | #7 | 54.64(50.0) | 100.2 | 7.02 | 9.95 | 1.32(0.0) | 0.049(0.0) | 0.21 |
| 7/2/2018 | #8 | 50.99(50.0) | 99.7 | 7.20 | 10.24 | 2.55(0.0) | 0.0090(-0.014) | 0.39 |
| 7/31/2018 | #7 | 49.94(50.0) | 100.0 | 6.82 | 9.74 | -0.18(0.0) | 0.07(0.058) | -0.06 |
| 8/28/2018 | #8 | 50.05(50.0) | 99.9 | 7.20 | 10.13 | -0.04(0.0) | 0.05(0.048) | 0.18 |
| 10/9/2018 | #7 | n/a | 100.3 | 7.18 | 9.97 | 0.9(0.0) | 0.151(0.141) | 0.06 |
| 11/13/2018 | #8 | 50.78(50.0) | 101.5 | 6.90 | 9.95 | -0.61(0.0) | 0.102(0.11) | -0.36 |
| 12/12/2018 | #5 | 50.41(50.0) | 100.5 | 7.25 | 10.22 | -0.44(0.0) | 0.035(0.027) | 0.20 |

*Note: pH post-deployment readings are temperature dependent and minor variations are expected as a result.

**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.

**For all data**
New deployments were flagged as <0> (CND).

Temperature affected measurements (SpCond/Salinity, pH) were rejected anytime the temperature sensor was affected by out of water events (pronounced change in temp values during extreme low tide readings).

Data affected by low tide were coded (CLT). Lower SpCond/Salinity was addressed with <1> (CLT) due to the probability of fresher surface waters being measured as the water level decreased. Salinities approaching zero or less were addressed as <-3> [GOW] (CLT) and affected data were also rejected accordingly.

All depth data corresponding to rejected or suspect SpCond/Salinity data (due to low tide) were also rejected <-3> [SOW] (CLT). The depth sensor is located above the Conductivity/Temperature (C/T) sensor and will be exposed when SpCond approaches 0.0. It is possible that some probes were still in the water during out of water events. The vertical orientation of the sondes means that shorter probes (pH, C/T) will be affected before longer probes (dissolved oxygen, turbidity).

All negative depth flagged and rejected unless affected by barometric pressure and coded as suspect <1> [SNV] (CAP).

Dissolved oxygen concentrations < 3 mg/L were coded <0> (CDA) along with corresponding values for DO% during hypoxic events.

Increased turbidity readings occurred throughout many deployments with unknown causes and were coded as such:
<-3> [STS] (CCU) = rejected turbidity spike
<1> [STS] (CCU) = Suspect turbidity spike

Small negative turbidity values < -2 NTU were flagged as suspect, <1> (CAF).

Negative chlorophyll values were flagged as <-3> [SNV] (CSM).

Chlorophyll spikes were flagged as suspect <1> [SCS] (CCU), or rejected <-3> [SCS] (CCU).

Hurricane Florence made landfall near Wrightsville Beach on September 14, 2018 at 06:15 EST, passing directly over our SWMP stations. This slow moving storm surpassed records for rainfall, with over 23 inches reported in Wilmington, NC. In an effort to minimize potential for equipment loss, sondes from two stations, East Cribbings and Loosin Creek, were removed prior to the storm on 09/10/2018. The research Creek and Zeke's Basin sondes continued to collect data during and following the storm. Very low salinity persisted for some time at the Zeke's Basin station, also influenced by the conditions of the Cape Fear River estuary. This data was retained and reflects conditions at that time.

The East Cribbings and Loosin Creek sondes that were removed prior to Hurricane Florence resulted in missing data from 9/10/2018 through 10/09/2018. The University of North Carolina Wilmington, where our offices are located, received substantial storm damage and was closed to personnel with operations suspended from September 11, 2018 through October 1, 2018.

## East Cribbings

### General

This station was converted to EXO2 sondes during 2015, beginning with the 09/15/2015 deployment.

This site has had increasing problems with mud and silt in the deployment tube, affected readings and filling the guard above the level of the sensors.

This site is within a shallow lagoonal system and the sonde is subject to out of water events, especially at spring low tides. (Vertical deployment has been in place since 12/04/12.)

Data were missing due to sonde swap : 07/31/2018 13:15

Data were missing sporadically and flagged <-2> [GPF], during the following time period due to power/battery failure:
01/05/2018 3:00 – 01/17/2018 7:45

Data was missing due to battery failure associated with wiper malfunction:
08/09/2018 15:45 – 08/28/2018 10:15

Data missing due to Hurricane Florence: 09/10/2018 10:15 – 10/09/2018 11:00, flagged <-2> [GSM] (CWE).

Data were missing due to a programming error, flagged <-2> [GMC]:
05/29/2018 10:15 – 05/30/2018 12:45

Data were Date/Time stamped incorrectly due to introduction of KOR2 software upgrade. Sonde time was set to UTC -0:00 instead of UTC -5:00. Use of KOR2 was discontinued after only 1 month because of several incompatibilities with SWMP protocols. These data were behind UTC-5:00 by 5 hrs and manually corrected. All affected data were flagged in the general F_Record column with {CSM}

01/17/2018 08:00 - 01/17/2018 12:45 → Data changed to <-2> [GPF] to reflect power failure during the previous deployment.

01/17/2018 13:00 - 03/20/2018 13:30 → Data advanced by 5 hrs.

Power failures occurred during several deployments due to malfunctioning sensors. Sensor failure prevented sonde from 'going to sleep' between deployments which reduced battery life causing a general power failure before the end of the deployment. These data are flagged <-2> [GPF] (SSM).

10/23/2018 19:45 - 11/13/2018 15:15 – Chlorophyll sensor, antifouling wiper module failure

11/25/2018 10:15 - 12/12/2018 13:00 – cause unknown

### Depth

There were several times that changes in barometric pressure affected the depth sensor. The depth records were flagged as suspect, <1> [SNV] (CAP) when the values were negative but the sensors were still in the water.

During the 05/30/2018 deployment, the temperature/conductivity probe failed, resulting in rejected date from 06/22/2018 through 07/03/2018.

**SpCond/Salinity**
This site experiences out of water events and may sample a fresh water lens in advance or following this events.

The SpCond/Salinity post-calibration values were unacceptable for several deployment periods. All data were flagged as suspect or rejected for the following affected deployments:
03/20/2018 suspect until 4/25/2018, rejected 04/25/2018 through 05/03/2018

During the 05/30/2018 deployment, the temperature/conductivity probe failed, resulting in rejected date from 06/22/2018 through 07/03/2018.

**Dissolved Oxygen**
Dissolved oxygen data can be quite variable. These cycles often correlate with tidal fluctuation, and may be accentuated by presence of invasive drift algae, *Gracilaria vermiculophylla*.

Values above 100% saturation are not uncommon and values above 200% may occur during warmer months. These reflect conditions at the site, occurring at the same time as elevated pH values and data were retained (unless affected by out of water events, potentially driven by *G. vermiculophylla* presence). Data were not flagged as suspect though some of the upper limits for percent saturation were surpassed.

The following deployments did not pass post calibration with acceptable values with rejected or suspect data:
03/20/2018 suspect through 04/20/2018, rejected 04/20/2018 through 05/03/2018
05/30/2018 – 07/02/2018 suspect
07/02/2018 suspect through 7/23/2018, rejected 7/23/2018 through 7/31/2018

During the 05/30/2018 deployment, the temperature/conductivity probe failed, resulting in rejected date from 06/22/2018 through 07/03/2018.

**pH**
pH postcal was unacceptable for the following deployments causing data to be flagged as suspect or rejected.
03/20/2018 suspect through 04/20/2018, rejected from 04/20/2018 through 05/03/2018
05/30/2018 – 07/02/2018 suspect

**Turbidity**
Elevated turbidity readings were rejected or flagged as suspect.
07/02/2018 deployment did not pass post calibration. Data from 07/02/2018 through 07/23/2018 was suspect and data from 07/23/2018 through 07/31/2018 was rejected.

08/29/2018 deployment did not pass post calibration. Values were likely elevated due to biofouling and from 09/05/2018 through the end of the deployment 09/10/2018, data were rejected.

**Chlorophyll**
Occasional chlorophyll spikes occurred and were flagged as suspect or rejected, cause unknown.

07/02/2018 deployment did not pass post calibration. Data from 07/02/2018 07/31/2018 was flagged as suspect.

## Loosin Creek

### General

This site typically has low turbidity values, occasionally these values approach zero and fit conditions of the site. Negative one readings were retained and marked as (CAF), acceptable calibration/accuracy error of the sensor.

This station was converted to EXO2 sondes during 2015, beginning with the 04/08/2015 deployment.

Missing records due to sonde swap:
02/06/2018 12:00
05/02/2018 10:00
12/11/2018 11:45

The sonde was pulled from this site prior to Hurricane Florence to minimize impact on equipment inventory. Potential for lost equipment was considered as early forecast models suggested a direct hit to our area from a category 3 or 4 storm was possible. Missing data: 9/10/2018 8:45 – 10/03/2018 14:00.

### Depth

There were several times that changes in barometric pressure affected the depth sensor. The depth records were flagged as suspect, <1> [SNV] (CAP) when the values were negative but the sensors were still in the water.

From 1/17 10:30 to 14:30 it appears that the sonde was hung up in the tube before falling to the correct depth. Depth data are marked 1 GSM CWD and all other parameters are marked 0 GSM CWD.

08/29/2018 deployment, an instrument malfunction resulted in no depth data collection for the entire deployment.

### SpCond/Salinity

The following deployments were flagged as suspect or rejected due to SpCond/Salinity post calibration values that were outside the acceptable range:
03/20/2018 – 04/18/2018 with elevated values rejected
04/19/2018 – 05/02/2018 rejected
10/03/2018 – 10/15/2018 suspect
10/16/2018 – 11/13/2018 rejected

On 05/16/18, salinity dropped to zero at the same time that chlorophyll went to a negative value. Data was rejected, cause unknown.

On 05/26/18 17:00, salinity dropped abruptly and was flagged as suspect, cause unknown.

SpCond/Salinity data was elevated during some of the high tide events from June 14-26, 2018. The data was retained and flagged as suspect. This sensor passed post calibration fine.

An out of water event occurred on 12/22/2018 1:00-1:15.

SpCond/Salinity data was elevated on 12/29/2018 3:00 and rejected, cause unknown.

**pH**
pH post calibration was elevated following
03/20/2018 deployment, suspect
05/30/2018 deployment, suspect
11/13/2018 deployment, suspect through 11/29/2018, rejected through the end of the deployment.
12/11/2018 deployment, suspect entire deployment

pH data flagged but post calibration values were okay:
02/06/2018 deployment, elevated values sporadically, rejected cause unknown
07/02/2018 deployment, within first hours pH values were elevated and rejected as unknown pH excursions, post cal values were fine

**Turbidity**
Elevated turbidity readings were rejected or flagged as suspect.

07/02/2018 deployment, post calibration values were elevated and entire deployment was flagged as suspect.

**Chlorophyll**
Negative chlorophyll values were flagged as <-3> [SNV].

Isolated chlorophyll spikes were retained unless above the sensor limit. These elevated values may result from macroalgae within the guard.

**Research Creek**
**General**
Missing data due to station maintenance:
05/30/2018 9:15

Missing data due to battery failure:
01/01/2018 – 01/17/2018 – Likely due to internal sonde error. Corrected during hard reset during deployments.
02/02/2018 – 02/06/2018 – Internal sonde error caused excessive file sizes leading to power failure. Resolved with hard reset.
02/06/2018 – 03/20/2018. General Power Failure only a few hours into deployment. Possibly due to turbidity sensor malfunction.

Missing data during the 10/03/2018 deployment due to unknown sonde malfunction. Battery voltage =6.4V. Sonde shutdown cause unknown. Affected data flagged <-2> [GIM] (CSM) from 10/03/2018 14:30 - 11/13/2018 12:15.

**Temperature**
Temperature and SpCond/Salinity data were not collected from 03/25/2018 through 05/02/2018 due to a probe failure and flagged <-2> [GIM], instrument malfunction. The few records that were collected during this time were rejected, <-3> [STF].

Temperature, SpCond/Salinity probe failure occurred during the 05/30/2018 deployment, resulting in rejected data from 05/30/2018 through 07/02/2018.

SpCond/Salinity failure occurred during the 08/01/2018 deployment resulting in flagging data suspect from 08/01/2018 through 08/29/2018. Data appear to fit conditions and fit well with adjacent deployments.

SpCond/Salinity failure caused rejection of SpConductivity, Salinity, DO mg/L, and depth. All affected data flagged <-3> [SCF].

10/03/2018 14:30 - 10/05/2018 18:00
12/11/2018 11:30 - 01/09/2019 13:30

**Depth**

Temperature and SpCond/Salinity data were not collected from 03/25/2018 through 05/02/2018 due to a probe failure and flagged <-2> [GIM], instrument malfunction. Some depth data is missing for this time period too, due to instrument malfunction. The depth records that were collected during this time were rejected, flagged as <-3> [STF].

Depth data was missing during the 05/30/2018 deployment due to failure of the SpCond/Salinity probe, flagged as <-2> [GIM]. Data resumes on 06/02/2018 but was rejected through the end of deployment, flagged as <-3> [STF].

Temperature, SpCond/Salinity probe failure occurred during the 05/30/2018 deployment, resulting in rejected data from 05/30/2018 through 07/02/2018. Some depth dat was missing, flagged as instrument malfunction.

SpCond/Salinity failure occurred during the 08/01/2018 deployment resulting in rejected data from 08/01/2018 through 08/29/2018. Depth calibrated incorrectly during this period as well. Data were rejected and flagged <-3> [SIC] (CSM).

SpCond/Salinity failure caused rejection of SpConductivity, Salinity, DO mg/L, and depth. All affected data flagged <-3> [SCF] (CSM).

10/03/2018 14:30 - 10/05/2018 18:00
12/11/2018 11:30 - 01/09/2019 13:30

**SpCond/Salinity**

Dips in salinity occurred during low tide. There may have been some stratification and sensors may be measuring a fresh water lens as approaching the surface.

SpCond/Salinity data was not collected from 03/25/2018 through 05/02/2018 due to a probe failure and flagged <-2> [GIM], instrument malfunction. The few records that were collected during this time were rejected, <-3> [STF].

Temperature, SpCond/Salinity probe failure occurred during the 05/30/2018 deployment, resulting in rejected data from 05/30/2018 through 07/02/2018.

SpCond/Salinity failure occurred during the 08/01/2018 deployment resulting in rejected data from 08/01/2018 through 08/29/2018. All associated data rejected also.

SpCond/Salinity failure caused rejection of SpConductivity, Salinity, DO mg/L, and depth. All affected data flagged <-3> [SCF] (CSM).

10/03/2018 14:30 - 10/05/2018 18:00
12/11/2018 11:30 - 01/09/2019 13:30

**Dissolved Oxygen**
Post calibration values not within acceptable range during the following the deployments and flagged suspect only <1> [SPC]:
12/11/2018 deployment – postcal failure. Already rejected due to Temp/SpCond failure.
05/30/2018 09:20 – 07/02/2018 11:40

SpCond/Salinity failure occurred during the 08/01/2018 deployment resulting in rejected data from 08/01/2018 through 08/29/2018.

SpCond/Salinity failure caused rejection of SpConductivity, Salinity, DO mg/L, and depth. All affected data flagged <-3> [STF] (CSM) or <-3> [SCF] (CSM).

03/25/2018 21:45 – 05/02/2018 10:15
08/01/2018 11:45 - 08/29/2018 10:45
10/03/2018 14:30 - 10/05/2018 18:00
12/11/2018 11:30 - 01/09/2019 13:30

**pH**
Postcalibration values not within acceptable range during the following the deployments due to biofouling. Data flagged suspect <1> [SPC] (CBF) or <-3> [SPC] (CSM) rejected through the end of the deployment.

12/11

Sensor suspected out of water during low tide. Data rejected <-3> [SOW] (CLT)
08/08/2018 10:30 -11:00

**Turbidity**
Turbidity spikes were rejected or flagged as suspect.

Sensor suspected out of water during low tide. Data rejected <-3> [SOW] (CLT)
08/08/2018 10:00 -10:45.

**Chlorophyll**
Sensor suspected out of water during low tide. Data rejected <-3> [SOW] (CLT)
08/08/2018 10:00 -11:00.

**<u>Zeke's Basin</u>**
**General**
This site is within a shallow lagoonal system and the sonde is subject to our of water events, especially at spring low tides.

Station converted to support EXO sondes 11/2/2016 11:45.
Station began collecting Chlorophyll data 05/29/2018 10:30.

Growth of invasive *Gracilaria vermiculophylla* has been heavy around this site. Increased biomass, sedimentation, and decaying organic material are becoming a chronic problem in this location. Optical probes are increasingly affected.

Missing data due sonde swap:

11/13/2018 15:30

Accumulation of mud in the sonde deployment tube/guard resulted in rejected and suspect data for DO, Turbidity, and Chlorophyll. Mud may affect probes individually. Most of these data are flagged as suspect <1> [SBO] (CMD) or <-3> [SBO] (CMD) when data are obviously affected by mud or outside the sensor range.

During the 12/12/2018 deployment, the wiper position was reported as not a number (NaN). This malfunction causes a voltage drop but luckily did not result in missing data.

**Temperature**
Negative temperature readings occurred in January 2018, the sensors appear to be in the water and data was retained.

**Depth**
There were several times that changes in barometric pressure affected the depth sensor. The depth records were flagged as suspect, <1> [SNV] (CAP) when the values were negative but the sensors were still in the water.

**SpCond/Salinity**
Specific conductivity failed to pass post calibration within acceptable range for the 01/17/2018 deployment. The entire deployment was flagged as suspect.

Sal/SpCond postcalibration a little low following the 03/20/2018 deployment. Data from subsequent deployment fits conditions and looks relatively seamless.

Specific conductivity failed to pass post calibration within acceptable range for the 05/29/2018 deployment. The entire deployment was flagged as suspect.

Hurricane Florence passed directly over this site on September 14, 2018, with nearby areas reporting over 23 inches of rainfall. Very low salinity persisted at this site as it was influenced by the low salinity within the Lower Cape Fear River. Salinity reading fell to near zero during the latter part of September.

Following the 10/09/2018 deployment, sonde was unable to see the SpCond sensor. After removing the sensor, one of the pins was broken off in the bulkhead. This sensor was not able to go through the post calibration procedure but data appears to fit conditions for the site.

**Dissolved Oxygen**
Especially during summer months, oxygen data can be quite variable. These cycles often correlate with tidal fluctuation and were likely driven by presence of drift algae (*Gracilaria vermiculophylla*).

High values were recorded for dissolved oxygen, sometimes surpassing 200% saturation. These reflect conditions at the site, occurring at the same time as elevated pH values and data were retained (unless affected by out of water events, potentially driven by *G. vermiculophylla* presence). Data were retained.

**pH**
Several pH values >9.0 were associated with high dissolved oxygen concentrations and presumed to be resulting from high rates of photosynthesis and a large standing crop of macrophytic algae, *G.*

*vermiculophylla,* in the area. The algal biomass is not ephemeral and therefore not considered an "algal bloom". These data were closely scrutinized and retained after determining the cause.

pH data were rejected from 01/01/2018 through 01/17/2018 due to elevated level in the field and during post calibration.

pH failed to pass post calibrations in one or more standard within acceptable range for the following deployments.

| | |
|---|---|
| 12/04/2017 | Data from 01/01/2018 through end of deployment rejected |
| 01/17/2018 | The entire deployment was flagged as suspect. |
| 07/02/2018 | pH=10 slightly out of range. Data look good across deployments. |
| 07/31/2018 | pH=10 slightly out of range. Data look good across deployments. |
| 12/12/2018 | both pH 7 & 10 slightly elevated, slope not within acceptable range |

Hurricane Florence passed directly over this site on September 14, 2018, with nearby areas reporting over 23 inches of rainfall. Lower than normal pH readings were observed at this site as it was influenced by the low salinity and lower pH waters of the Lower Cape Fear River.

**Turbidity**

Periods of elevated turbidity values were crosschecked with weather data to determine if they were driven by weather. Turbidity at Zeke's Basin station is particularly sensitive to high or sustained winds due to winds during periods of low water and is a normal occurrence. All data above 1000 NTU were rejected <-3> [STS].

Turbidity failed to pass post calibrations within acceptable range for the following deployments. The entire deployment was flagged as suspect.

| | |
|---|---|
| 07/02/2018 | conditions fit the site |

**Chlorophyll a**

This station began collecting chlorophyll a data on 05/29/2018.

Isolated chlorophyll spikes were retained unless above the sensor limit. These elevated values may result from macroalgae within the guard.