North Carolina (NOC) NERR Water Quality Metadata
January 1, 2015 – December 31, 2015
Latest Update: July 20, 2017

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons

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2) Entry verification

Deployment data are uploaded from the YSI data logger to a Personal Computer (IBM compatible). Files are exported from EcoWatch in a comma-delimited format (.CDF) 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 6600EDS 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. 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 2015, chlorophyll data was collected at East Cribbings and Loosin 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.

6) Data collection period

East Cribbings Data Collection

Deploy		Retrieve		Model Numbers						
Date	Time	Date	Time	Sonde (Nickname)	pH	roxDO	Turb	Cond	Chloro	EXO
12/12/2014	12:15	1/7/2015	13:30	6600V2 (35V EC)	6561	6150	6136	6560	6025	no
1/7/2015	13:45	2/4/2015	13:15	6600V2 (33V)	6561	6150	6136	6560	6025	no
2/4/2015	13:30	3/6/2015	11305	6600V2 (35V EC)	6561	6150	6136	6560	6025	no
3/6/2015	12:00	4/9/2015	12:30	6600V2 (33V)	6589	6150	6136	6560	6025	no
4/9/2015	12:30	5/4/2015	9:15	6600V2 (35V EC)	6561	6150	6136	6560	6025	no
5/4/2015	9:2830	6/2/2015	10:45	6600V2 (33V)	6589	6150	6136	6560	6025	no
6/2/2015	11:15	6/16/2015	9:45	6600EDSV2 (#38V)	6561	6150	6136	6560	6025	no
6/16/2015	10:00	7/6/2015	13:15	6600V2 (33V)	6589	6150	6136	6560	6025	no
7/6/2015	13:30	7/20/2015	13:15	6600EDSV2 (#38V)	6561	6150	6136	6560	6025	no
7/20/2015	13:30	8/5/2015	13:15	6600V2 (33V)	6589	6150	6136	6560	6025	no
8/5/2015	13:30	8/20/2015	10:45	6600EDSV2 (#38V)	6561	6150	6136	6560	6025	no
8/20/2015	11:00	9/2/2015	11:45	6600V2 (33V)	6589	6150	6136	6560	6025	no
9/2/2015	12:00	9/15/2015	10:15	6600EDSV2 (#38V)	6561	6150	6136	6560	6025	no
9/15/2015	10:30	10/15/2015	9:30	EXO2 (#3)	599702	599100-01	599101-01	599870	599103-01	yes
10/15/2015	9:45	11/3/2015	15:15	EXO2 (#4)	599702	599100-01	599101-01	599870-01	599103-01	yes
11/3/2015	15:30	12/1/2015	15:15	EXO2 (#3)	599702	599100-01	599101-01	599870	599103-01	yes
12/1/2015	15:30	1/12/2016	13:00	EXO2 (#4)	599702	599100-01	599101-01	599870-01	599103-01	yes

Loosin Creek Data Collection

Deploy		Retrieve		Model Numbers						
Date	Time	Date	Time	Sonde (Nickname)	pH	roxDO	Turb	Cond	Chloro	EXO
12/11/2014	13:45	1/7/2015	11:30	6600V2 (34)	6561	6150	6136	6560		no
1/7/2015	11:45	2/4/2015	11:45	6600EDSV2 (20V)	6561	6150+	6136	6560	6025	no
2/6/2015	12:15	3/5/2015	9:30	6600EDSV2 (20V)	6579	6150+	6136	6560	6025	no
3/5/2015	9:45	4/8/2015	11:15	6600EDSV2 (#38V)	6561	6150	6136	6560	6025	no
4/8/2015	11:30	5/5/2015	9:15	EXO2 (EXO#2)	599702	599100-01	599101-01	599870-01	599103-01	yes
5/5/2015	9:30	6/2/2015	9:00	EXO2 (EXO #1)	599702	599100-01	59910101	599870-01	599103-01	yes
6/2/2015	9:15	6/17/2015	9:30	EXO2 (EXO#2)	599702	599100-01	599101-01	599870-01	599103-01	yes
6/17/2015	9:45	7/7/2015	12:15	EXO2 (EXO #1)	599702	599100-01	59910101	599870-01	599103-01	yes
7/7/2015	12:30	7/21/2015	11:00	EXO2 (EXO#2)	599702	599100-01	599101-01	599870-01	599103-01	yes
7/21/2015	11:15	8/5/2015	10:45	EXO2 (EXO #1)	599702	599100-01	59910101	599870-01	599103-01	yes

8/5/2015	11:00	8/19/2016	10:45	EXO2 (EXO#2)	599702	599100-01	599101-01	599870-01	599103-01	yes
8/19/2015	11:00	9/2/2015	10:45	EXO2 (EXO #1)	599702	599100-01	59910101	599870-01	599103-01	yes
9/2/2015	11:00	9/16/2015	9:45	EXO2 (EXO#2)	599702	599100-01	599101-01	599870-01	599103-01	yes
9/16/2015	10:00	10/14/2015	11:30	EXO2 (EXO #1)	599702	599100-01	59910101	599870-01	599103-01	yes
10/14/2015	11:45	11/3/2015	11:45	EXO2 (EXO#2)	599702	599100-01	599101-01	599870-01	599103-01	yes
11/4/2015	15:00	12/1/2015	12:00	EXO2 (EXO#2)	599702	599100-01	599101-01	599870-01	599103-01	yes
12/1/2015	12:15	1/12/2016	11:00	EXO2 (EXO #1)	599702	599100-01	59910101	599870-01	599103-01	yes

Research Creek Data Collection

Deploy		Retrieve		Model Numbers						
Date	Time	Date	Time	Sonde (Nickname)	pH	roxDO	Turb	Cond	Chloro	EXO
12/11/2014	14:00	1/7/2015	11:45	6600EDSV2 (37V)	6561	606150	6136	6560	n/a	no
1/7/2015	12:00	2/4/2015	12:00	6600EDS (32)	6561	606150	606136	6560	n/a	no
2/4/2015	12:15	3/5/2015	9:15	6600EDSV2 (37V)	6561	606150	6136	6560	n/a	no
3/5/2015	9:30	4/8/2015	10:30	6600EDS (32)	6561	606150	606136	6560	n/a	no
4/8/2015	10:45	5/5/2015	9:00	6600EDSV2 (37V)	6561	606150	6136	6560	n/a	no
5/5/2015	9:15	6/2/2015	8:45	6600EDS (32)	6561	606150	606136	6560	n/a	no
6/2/2015	900	6/17/2015	8:30	6600EDSV2 (37V)	6561	606150	6136	6560	n/a	no
6/17/2015	8:45	7/7/2015	12:00	6600EDS (32)	6561	606150	606136	6560	n/a	no
7/7/2015	12:15	7/21/2015	11:00	6600EDSV2 (37V)	6561	606150	6136	6560	n/a	no
7/21/2015	11:15	8/5/2015	10:30	6600EDS (32)	6561	606150	606136	6560	n/a	no
8/5/2015	10:45	8/19/2015	11:00	6600EDSV2 (37V)	6561	606150	6136	6560	n/a	no
8/19/2015	11:15	9/2/2015	10:30	6600EDS (32)	6561	606150	606136	6560	n/a	no
9/2/2015	10:45	9/16/2015	10:00	6600EDSV2 (37V)	6561	606150	6136	6560	n/a	no
9/16/2015	10:15	10/14/2015	11:30	6600EDS (32)	6561	606150	606136	6560	n/a	no
10/14/2015	12:00	11/3/2015	11:30	6600EDSV2 (37V)	6561	606150	6136	6560	n/a	no
11/3/2015	11:45	12/1/2015	11:45	6600EDS (32)	6561	606150	606136	6560	n/a	no
12/1/2015	12:00	1/12/2016	10:45	6600EDSV2 (37V)	6561	606150	6136	6560	n/a	no

Zeke's Basin Data Collection

Deploy		Retrieve		Model Numbers						
Date	Time	Date	Time	Sonde (Nickname)	pH	roxDO	Turb	Cond	Chloro	EXO
12/11/2014	12:30	1/21/2015	11:00	6600EDS (24)	6561	6150	6136	6560	n/	no
1/21/2015	11:30	2/4/2015	13:15	6600EDS (17)	6561	6150	606136	6560	n/a	no
2/4/2015	13:45	3/6/2015	12:00	6600EDS (24)	6561	6150	6136	6560	n/a	no
3/6/2015	12:30	4/9/2015	12:45	6600EDS (21)	6579	6150	6136	6560	n/a	no
4/9/2015	13:00	5/4/2015	9:45	6600EDS (28)	6561 FG	6150	6136	6560	n/a	no
5/4/2015	10:15	6/2/2015	11:00	6600EDS (21)	6579	6150	6136	6560	n/a	no
6/2/2015	11:15	6/16/2015	10:00	6600EDS (28)	6561 FG	6150	6136	6560	n/a	no

6/16/2015	10:15	7/6/2015	13:30	6600EDS (21)	6579	6150	6136	6560	n/a	no
7/6/2015	13:45	7/20/2015	13:30	6600EDS (28)	6561	6150	6136	6560	n/a	no
7/20/2015	14:00	8/5/2015	13:30	6600EDS (21)	6579	6150	6136	6560	n/a	no
8/5/2015	13:45	8/20/2015	11:00	6600EDS (#28)	6561	6150	6136	6560	n/a	no
8/20/2015	11:15	9/2/2015	12:00	6600EDS (21)	6561	6150	6136	6560	n/a	no
9/2/2015	12:15	9/15/2015	10:30	6600EDS (#28)	6561	6150	6136	6560	n/a	no
9/15/2015	10:45	10/15/2015	9:45	6600EDS (21)	6561	6150	6136	6560	n/a	no
10/15/2015	10:00	11/3/2015	15:30	6600EDS (#28)	6561	6150	6136	6560	n/a	no
11/3/2015	15:45	12/1/2015	15:00	6600EDS (21)	6561	6150	6136	6560	n/a	no
12/1/2015	15:15	1/12/2016	13:15	6600EDS (28)	6561 FG	6150	6136	6560	n/a	no

7) Distribution

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

NERR water quality data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see Principal Investigators and Contact Persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under the general information link on the CDMO home page) and online at the CDMO home page http://cdmo.baruch.sc.edu/. Data are available in text tab-delimited format.

8) Associated researchers and projects

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 the water quality data.

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 6600EDS at Research Creek and Zeke's Basin during 2015 and at East Cribbings from January to September 2015 and Loosin Creek for January – April 2015. EXO sondes were

used at East Cribbings and Loosin Creek beginning September 15 2015, and at Loosin Creek starting April 15 2015. Include the parameter description, units, sensor type, model #, range of measurement, accuracy and resolution for each sensor for all measuring devices (6600, 6600 EDS, 6600 EDS V2, 6600 V2, or EXO).

YSI 6600EDS data sonde:
Parameter: Non-vented Level EDS-S
Units: meters
Sensor Type: Stainless steel strain gauge
Range: 0 to 10ft
Accuracy: +/- 0.06 ft (0.018 m)
Resolution: 0.001 ft (0.001 m)

YSI 6600V2-4 data sonde:
Parameter: Vented Level V2-SV
Units: meters
Sensor Type: Stainless steel strain gauge
Range: 0 to 10m
Accuracy: ±0.01 ft, 0.003 m
Resolution: 0.001 ft (0.001 m)

YSI 6600 V2 vented data sonde:
Parameter: Vented Level V2-SV
Units: meters
Sensor Type: Stainless steel strain gauge
Range: 0 to 10m
Accuracy: ±0.06 ft, ±0.02 m
Resolution: 0.001 ft (0.001 m)

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

Parameter: Conductivity
Units: milli-Siemens per cm (mS/cm)
Sensor Type: 4-electrode cell with autoranging
Model#: 6560
Range: 0 to 100 mS/cm
Accuracy: +/- 0.5% of reading + 0.001 mS/cm
Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependant)

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

Parameter: Dissolved Oxygen % Saturation
Sensor Type: Optical probe w/ mechanical cleaning

Model#: 6150 ROX
Range: 0 to 500% air saturation
Accuracy: 0-200% air saturation: +/- 1% of the reading or 1% air saturation, whichever is greater 200-500% air saturation: +/- 15% or reading
Resolution: 0.1% air saturation

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

Parameter: Non-vented Level – Shallow (0-10m)
Units: meters
Sensor Type: Stainless steel strain guage
Range 0-30ft
Accuracy: +/- 0.06 ft (0.018m)
Resolution: 0.001 ft (0.001m)

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

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

Parameter: Chlorophyll
Units: µg/L
Sensor Type: Optical
Model#: 6025
Range: 0 – 400 µg/L
Resolution: 0.1 µg/L Chl

Dissolved Oxygen Qualifier (Rapid Pulse / Clark type sensor):
The reliability of dissolved oxygen (DO) data collected with the rapid pulse / Clark type sensor after 96 hours post-deployment for non-EDS (Extended Deployment System) data sondes may be problematic due to fouling which forms on the DO probe membrane during some deployments (Wenner et al. 2001). Some Reserves utilize the YSI 6600 EDS data sondes, which increase DO accuracy and longevity by reducing the environmental effects of fouling. Optical DO probes have further improved data reliability. The user is therefore advised to consult the metadata for sensor type information and to exercise caution when utilizing rapid pulse / Clark type sensor DO data beyond the initial 96-hour time period. Potential drift is not always problematic for some uses of

the data, i.e. periodicity analysis. It should also be noted that the amount of fouling is very site specific and that not all data are affected. If there are concerns about fouling impacts on DO data beyond any information documented in the metadata and/or QAQC flags/codes, please contact the Research Coordinator at the specific NERR site regarding site and seasonal variation in fouling of the DO sensor.

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
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

Deploy Date	Sonde Nickname	SpCond	ROXDO1	ROXDO2	pH7	pH10	Turb	Depth	CHL(0)
1/7/2015	33V	49.15(50.0)	100	99.6	7.09	9.99	-2.21(0.0)	0.027(-0.083)	-0.1
2/4/2015	35V EC	49.91(50.0)	100.1	100.2	7.17	10	0.0(0.0)	-0.155(0.079)	0.2
3/6/2015	33V	50.91(50.0)	98.6	98.7	7.09	10	0.4(0.0)	-0.0040(0.027)	0.2
4/9/2015	35V EC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
5/4/2015	33V	50.7(50.0)	98	98	6.97	9.94	1.4(0.0)	-0.115(0.017)	-0.8
6/2/2015	#38V	50.45(50.0)	69.9	69.6	6.91	10.10	0.8(0.0)	-1.75(-0.014)	0.4
6/16/2015	33V	26.21(50.0)	99.5	99.7	6.86	9.88	1.8(0.0)	-0.014(0.027)	0.5
7/6/2015	#38V	49.51(50.0)	100.7	100.7	7.08	9.99	-0.4(0.0)	-0.173(-0.073)	0.7
7/20/2015	33V	54.69(50.0)	99.5	99.2	6.98	9.56	0.3(0.0)	0.243(0.0060)	0.8
8/5/2015	#38V	51.19(50.0)	101.8	101.9	7.07	9.91	0.6(0.0)	0.0010(0.0)	0.3
8/20/2015	33V	50.9(50.0)	98.6	99.1	7.07	9.63	1.0(0.0)	0.0010(-0.0040)	0
9/2/2015	#38V	51.37(50.0)	99.1		6.88	9.90	0.7(0.0)	0.0010(0.0)	-0.1
9/15/2015	#3	50.2(50.0)	101.4	101.4	7.17	10.1	-0.88(0.0)	0.018(0.12)	-0.26
10/15/2015	#4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
11/3/2015	#3	50.04(50.0)	98.9		6.79	10.00	-0.39(0.0)	-0.025(-0.025)	-0.01
12/1/2015	#4	49.54(50.0)	101.0	101.0	7.07	10.1	0.1(0.0)	0.064(0.079)	0.24

Loosin Creek Post Calibration Data

Deploy Date	Sonde Nickname	SpCond	ROXDO1	ROXDO2	pH7	pH10	Turb	Depth	CHL(0)
1/7/2015	20V	50.55(50.0)	97.1	97.1	6.92	9.93	-0.1(0.0)	0.038(0.048)	0.5
2/6/2015	20V	50.77(50.0)	99.0	99.0	7.00	9.89	0.0(0.0)	0.083(0.079)	0.2
3/5/2015	#38V	49.87(50.0)	98.7	98.8	6.60	9.61	-0.2(0.0)	0.014(0.027)	30.4
4/8/2015	EXO#2	50.12(50.0)	100.1	100.1	7.06	10.1	0.1(0.0)	0.011(-0.0040)	0.04
5/5/2015	EXO #1	49.01(50.0)	100.7	100.7	7.14	10.1	-0.05(0.0)	-0.104(0.0060)	-0.01
6/2/2015	EXO#2	48.88(50.0)	97.9	98.0	7.11	10	-0.22(0.0)	0.035(-0.014)	0.31
6/17/2015	EXO #1	51.6(50.0)	100.1	100.0	7.09	9.94	-0.76(0.0)	0.049(0.0)	0.44
7/7/2015	EXO#2	50.79(50.0)	98.9	98.9	6.98	9.93	0.46(0.0)	-0.025(-0.025)	1.07
7/21/2015	EXO #1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8/5/2015	EXO#2	48.35(50.0)	99.8	99.8	7.08	10	-0.44(0.0)	-0.013(-0.014)	0.18
8/19/2015	EXO #1	44.43(50.0)	99.8	99.8	7.03	10.2	0.6(0.0)	-0.025(-0.025)	0.34
9/2/2015	EXO#2	49.19(50.0)	99.3	99.3	7.06	10	-0.17(0.0)	-0.031(-0.0040)	0
9/16/2015	EXO #1	55.4(50.0)	100.4	100.4	7.38	10.3	-0.23(0.0)	0.115(0.12)	0.03
10/14/2015	EXO#2	49.33(50.0)	99.2	99.2	6.98	9.95	0.56(0.0)	0.074(0.079)	-0.6
11/4/2015	EXO#2	88.0(50.0)	99.8		7.03	10	0.51(0.0)	-0.067(-0.063)	
12/1/2015	EXO #1	49.23(50.0)	100.0	100.0	13.3	15.5	0.33(0.0)	-0.046(0.079)	0.21

Research Creek Post Calibration Data

Deploy Date	Sonde Nickname	SpCond	ROXDO1	ROXDO2	pH7	pH10	Turb	Depth	CHL(0)
1/7/2015	32	50.85(50.0)	96.6	96.6	6.92	9.91	0.0(0.0)	-0.086(-0.083)	n/a
2/4/2015	37V	50.1(50.0)	99.9		7.01	9.85	0.7(0.0)	0.08(0.065)	n/a
3/5/2015	32	51.33(50.0)	100.2	100.6	7.03	10.00	1.1(0.0)	0.04(0.027)	n/a
4/8/2015	37V	49.17(50.0)	100.5	99.5	7.10	10.1	-3.3(0.0)	0.049(0.017)	n/a
5/5/2015	32	49.04(50.0)	98.0	98.1	7.39	9.66	-1.1(0.0)	-0.024(0.017)	n/a
6/2/2015	37V	49.95(50.0)	104.3	104.3	7.11	9.14	0.8(0.0)	-0.01(-0.014)	n/a
6/17/2015	32	49.05(50.0)	99.5	99.5	7.02	9.72	81.2(0.0)	0.022(0.017)	n/a
7/7/2015	37V	50.29(50.0)	99.3	99.2	7.56	10.4	1.7(0.0)	-0.022(-0.025)	n/a
7/21/2015	32	48.51(50.0)	99.7	99.6	6.83	9.77	0.1(0.0)	0.013(0.0060)	n/a
8/5/2015	37V	49.88(50.0)	104.6	107.6	7.61	10.4	1.2(0.0)	-0.021(-0.014)	n/a
8/19/2015	32	49.27(50.0)	100.9	98.9	7.05	10.1	0.9(0.0)	-0.0040(-0.0040)	n/a
9/2/2015	37V	34.98(50.0)	106.5	106.5	6.92	9.91	0.6(0.0)	-0.036(-0.025)	n/a
9/16/2015	32	48.32(50.0)	101.0	101.0	7.13	10.1	0.3(0.0)	0.111(-0.026)	n/a
10/14/2015	37V	50.87(50.0)	99.7	99.6	7.07	10	-0.1(0.0)	0.046(0.069)	n/a
11/3/2015	32	49.46(50.0)	100.5	100.6	7.36	10.4	1.0(0.0)	-0.065(-0.063)	n/a
12/1/2015	37V	46.67(50.0)	99.7	99.7	6.86	9.76	-0.6(0.0)	0.027(0.0010)	n/a

Zeke's Basin Post Calibration Data

Deploy Date	Sonde Nickname	SpCond	ROXDO1	ROXDO2	pH7	pH10	Turb	Depth	CHL(0)
1/21/2015	17	49.91(50.0)	99.8	99.9	7.01	9.94	1.7(0.0)	-0.087(-0.083)	n/a
2/4/2015	24	49.8(50.0)	100.2	100.3	7.00	9.75	-0.3(0.0)	0.016(0.079)	n/a
3/6/2015	21	51.39(50.0)	100.0	100.3	7.32	10.3	1.4(0.0)	0.022(0.027)	n/a
4/9/2015	28	50.39(50.0)	98.0	98.0	7.04	10.1	-0.5(0.0)	(-0.0040)	n/a
5/4/2015	21	34.89(50.0)	98.1	98.3	6.92	9.90	-19.4(0.0)	0.013(0.017)	n/a
6/2/2015	28	17.6(50.0)	98.9		6.70	9.67	1.1(0.0)	0.02(0.0)	n/a
6/16/2015	21	51.4(50.0)	99.9	99.8	6.97	9.90	-0.9(0.0)	0.04(0.027)	n/a
7/6/2015	28	28.48(50.0)	99.1	98.9	6.88	9.88	-0.6(0.0)	-0.068(-0.073)	n/a
7/20/2015	21	49.5(50.0)	99.2	99.2	7.14	9.95	1.3(0.0)	0.01(0.0060)	n/a
8/5/2015	28	49.69(50.0)	102	102	7.10	10	1.4(0.0)	-0.017(-0.014)	n/a
8/20/2015	21	48.55(50.0)	99.5	99.5	7.02	9.99	0.3(0.0)	0.0090(-0.0040)	n/a
9/2/2015	28	52.13(50.0)	96.4	96.4	7.24	10.2	-4.4(0.0)	-0.03(-0.025)	n/a
9/15/2015	21	48.75(50.0)	101.0	101.0	7.16	10.1	0.9(0.0)	0.113(0.11)	n/a
10/15/2015	28	50.59(50.0)	99.7	99.6	7.14	10.1	-0.7(0.0)	0.072(0.069)	n/a
11/3/2015	21	50.95(50.0)	99.3	99.2	6.96	9.91	0.0(0.0)	0.012(0.027)	n/a
12/1/2015	28	49.13(50.0)	98.8	98.8	6.91	9.86	1.0(0.0)	0.031(0.0)	n/a

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 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).

East Cribbings

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

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.)

Missing records due to battery failure: 04/03/2015 18:15 - 04/09/2015 12:45, and 12/15/2015 05:15 – 01/12/2016 13:00

Data were missing due to a sonde swap: 03/06/2015 11:45, 06/02/2015 11:00

Data were missing due to an error in programming:
07/20/2015 13:30 – 23:45
10/15/2015 09:45 - 11/03/2015 15:30

Data were rejected as sonde was pulled from the water during Hurricane Joaquin 10/01/2015 – 10/07/2015. Affected data flagged <-3> [GOW] (CSM). Sonde was removed prior to the storm and returned after. The sonde was not checked or calibrated again before being deployed again on 10/7.

Deployment Data flagged suspect - 02/04/2015 13:30. There was a very slight drop in pH, salinity and a small turbidity spike in the reading following deployment. This could have been due to disturbance by the research vessel as well as acclimation to submerged conditions. Data still seem to fit conditions.

Missing records due to instrument failure: 04/09/2015 13:00– 05/04/2015 9:15 deployment data not retrieved. Sonde would not communicate and is waiting on repairs to retrieve data. Data flagged <-2> [GIM] (CSM).

Accumulation of mud in the sonde deployment tube/guard resulted in rejected and suspect data for DO, Turbidity, and Chlorophyll. Mud began to affect probes individually beginning with DO on 05/08/2015 00:15 and continued through the following deployment to 06/22/2015 16:30. 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.

Many parameters fluctuated following Hurricane Joaquin. The area received 12-15 inches of rainfall and the sounds and estuarine areas were significantly affected. Temperature, SpCond/Salinity, Dissolved Oxygen and pH values were lower following the storm and fresh water influence, while turbidity values increased during this time.

Depth

There were several times throughout the year where changes in barometric pressure affected the depth sensor resulting in negative depth data. The corrected depth parameter adjusts for changes in barometric pressure. Where the depth reading is negative before and after corrected, data were flagged -3 SOW. Where depth readings were positive before correction and negative after correction, data were flagged -3 SOW. Where depth readings were negative before correction and positive after corrected, data were flagged 1 SNV CAP.
Data were rejected as sonde was pulled from the water during Hurricane Joaquin 10/01/2015 – 10/07/2015.

SpCond/Salinity

06/16/2015 deployment, post calibration values were outside the acceptable range. Values seem elevated and the entire deployment was flagged as suspect.

07/21/2015 deployment, post calibration values were outside the acceptable range. Values seem elevated and the entire deployment was flagged as suspect.

Data were rejected as sonde was pulled from the water during Hurricane Joaquin 10/01/2015 – 10/07/2015.

SpCond/Salinity was lower than usual following Hurricane Joaquin. The area received 12-15 inches of rainfall and the sounds and estuarine areas were significantly affected.

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.

DO post calibration unacceptable during 06/02/2015 – 06/16/2015. Sensor likely affected by accumulation of mud in the guard. All data rejected for sensor blocked by mud. <-3> [SBO] (CMD).

Data were rejected as sonde was pulled from the water during Hurricane Joaquin 10/01/2015 – 10/07/2015.

Dissolved oxygen values were lower than usual following Hurricane Joaquin. The area received 12-15 inches of rainfall and the sounds and estuarine areas were significantly affected.

pH

The pH post-calibration values were unacceptable for several deployment periods. All data were flagged as suspect for the following affected deployments:
07/21/2015, post cal fine in 7 standard, low in 10 standard. Data fits conditions for the site.
08/20/2015, post cal fine in 7 standard, low in 10 standard. Values fluctuated but may have been a little low.

Data were rejected as sonde was pulled from the water during Hurricane Joaquin 10/01/2015 – 10/07/2015.

Turbidity

01/07/15 deployment, turbidity values were not in the acceptable range for post calibration. The probe read 2.2 NTU in 0 calibration solution. Data seem to fit conditions and the cause is unknown, flagged as suspect. <1> [SPC] (CCU).

Negative turbidity values were flagged as suspect <1> [GSM] (CAF) on 09/24/2015 1:45-3:30. All other parameters look fine and probe passed post calibration.

Data were rejected as sonde was pulled from the water during Hurricane Joaquin 10/01/2015 – 10/07/2015.

Turbidity spikes were rejected on 10/11/2015 14:30, 15:45, and 17:30.

Chlorophyll

Data were rejected as sonde was pulled from the water during Hurricane Joaquin 10/01/2015 – 10/07/2015.

<u>Loosin Creek</u>

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 maintenance: 02/04/2015 11:45 – 02/06/2015 12:00 during this time sonde inventory was depleted.

Missing records due to battery failure: 02/15/2015 – 03/05/2015, 09/14/2015 – 09/16/2015.

Missing data due to programming or file retrieval error: 01/01/2015 – 01/07/2015, 06/02/2015 – 06/17/2015 and 07/21/2015 – 08/05/2015, and 11/03/2015 – 11/04/2015.

Data were rejected as sonde was pulled from the water during Hurricane Joaquin 10/01/2015 – 10/07/2015. Affected data flagged <-3> [GOW] (CSM). Sonde was removed prior to the storm and returned after. The sonde was not checked or calibrated again before being deployed again on 10/7.

Out of water events are described in the depth section.

Many parameters fluctuated following Hurricane Joaquin. The area received 12-15 inches of rainfall and the sounds and estuarine areas were significantly affected. Temperature, SpCond/Salinity, Dissolved Oxygen and pH values were lower following the storm and fresh water influence, while turbidity values increased during this time.

Depth

There were several times throughout the year where changes in barometric pressure affected the depth sensor resulting in negative depth data. The corrected depth parameter adjusts for changes in barometric pressure. Where the depth reading is negative before and after corrected, data were flagged -3 SOW. Where depth readings were positive before correction and negative after correction, data were flagged -3 SOW. Where depth readings were negative before correction and positive after corrected, data were flagged 1 SNV CAP.
03/05/2015 deployment, sonde inventory was low and a vented sonde was deployed at this station rather than have extended data gaps. The depth data were rejected for the entire deployment but other parameters were not affected.

On 04/21/2015 and 05/18/2015, a few depth readings were negative though the probes appear to still be in the water. These were flagged suspect, <1> [SNV] (CAP), affected by atmospheric pressure.

11/19/2015 – 12/01/2015, depth data rejected due to specific conductivity probe failure.

SpCond/Salinity

Values during the 06/17/2015 and 07/07/2015 deployments seem elevated. Both deployments calibrated and post calibrated within acceptable range. Data was flagged as suspect due to QA/QC checks and may have been affected by contaminated/evaporated SpCond standard.

The following deployments were flagged as suspect due to SpCond/Salinity post calibration values that were outside the acceptable range:

08/05/2015, data appear to fit conditions for the site
08/19/2015, data appear to fit conditions for the site. There was a slight dip in values on 08/19/2015 around 13:00 – 19:00 that corresponds with a dip recorded at Research Creek.

09/16/2015 deployment, post calibration was not within acceptable range and data appear to be elevated. Data for the entire deployment was rejected.

During the 11/04/2015 deployment the specific conductivity probe failed, resulting in rejected data for SpCond/Salinity, dissolved oxygen and depth for 11/19/2015 – 12/01/2015.

Dissolved Oxygen

01/07/15 deployment, dissolved oxygen post calibration values were slightly below acceptable range. Data were flagged as suspect but appear to fit conditions.

11/19/2015 – 12/01/2015, depth data rejected due to specific conductivity probe failure.

pH

03/05/15 deployment, pH post calibration values were outside of acceptable ranges for both the 7 and 10 standards. The entire deployment was flagged as suspect.

09/16/15 deployment, pH post calibration values were outside of acceptable ranges for both the 7 and 10 standards. The entire deployment was flagged as suspect.

12/01/2015 deployment, pH post calibration values outside acceptable ranges and data for entire deployment were rejected.

Turbidity

This station converted to EXO2 sondes beginning with the 04/08/2015 deployment. The EXO2 sondes have larger sensor range for turbidity and values above 4000 NTU were automatically flagged and rejected. There were still many values below this threshold that were deemed as turbidity spikes and flagged as suspect or rejected.

01/07/15 deployment, macro algae (*Enteromorpha spp*) was wrapped around the turbidity wiper upon sonde retrieval. Elevated data were rejected beginning 02/01/2015.

03/05/15 deployment, values were elevated beginning on 03/07/15 and again 03/14/2015, cause unknown. Following this period of elevated values, some negative values were present in latter part of deployment. These were within the range of the sensor and flagged as suspect. The probe passed post calibration.

12/01/2015 deployment, some turbidity spikes rejected as surrounding data values were very low, flagged as <-3> [STS] (CCU).

Chlorophyll

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

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

01/07/15 deployment, macro algae (*Enteromorpha spp*) was wrapped around the wiper assembly upon retrieval. Elevated data were rejected or flagged as suspect.

02/06/15 deployment, many elevated values were rejected, <-3> [SCS] (CCU).

03/05/15 deployment, almost the entire deployment had uncharacteristically high values. These were rejected and cause is unknown. This probe also had elevated readings for chlorophyll during the post calibration.

12/01/2015 deployment, many elevated values were rejected, <-3> [SCS] (CCU).

<u>Research Creek</u>

General

Missing due to sonde swap: 05/05/2015 9:00 10/14/2015 11:45

Missing data for unknown reason, potentially low battery or dampness in the connection: intermittently 07/07/15 – 07/21/15.

Missing data due to battery failure:

03/04/15 10:15 – 03/05/15 9:15
Intermittently during 03/24/15 – 03/28/15
03/28/15 – 04/08/15
07/07/15 12:15 – 13:30
Intermittently 07/07/2015 – 07/21/2015, maybe cable issues

Many parameters fluctuated following Hurricane Joaquin. The area received 12-15 inches of rainfall and the sounds and estuarine areas were significantly affected. Temperature, SpCond/Salinity, Dissolved Oxygen and pH values were lower following the storm and fresh water influence, while turbidity values increased during this time.

Depth

There were several times throughout the year where changes in barometric pressure affected the depth sensor resulting in negative depth data. The corrected depth parameter adjusts for changes in barometric pressure. Where the depth reading is negative before and after corrected, data were flagged -3 SOW. Where depth readings were positive before correction and negative after correction, data were flagged -3 SOW. Where depth readings were negative before correction and positive after corrected, data were flagged 1 SNV CAP.

08/05/2015 deployment, depth was disjunct from previous deployments and did not fit the usual tidal pattern for the site. Cause of malfunction is unknown but could be related to conductivity failure that occurred intermittently during the first half of the deployment. Depth data were rejected for 08/05/2015 – 08/13/2015. The depth seemed to reset and appears to fit conditions for the site beginning 08/13/2015.

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.

03/05/2015 deployment, SpCond/Salinity was slightly outside acceptable range for post calibration. The data seem to fit conditions for the site but were flagged as suspect <1> [SPC] (CDF).

08/05/2015 deployment, intermittent SpCond/Salinity failure affected all parameters and resulted in rejected data through 08/13/2015.

09/02/2015 deployment, SpCond calibrated fine but was disjunct from previous data and seemed elevated. This probe failed to pass post calibration within acceptable values and the entire deployment was rejected.

09/16/2015 deployment, SpCond was barely outside the acceptable range for post calibration. The entire deployment was flagged as suspect but appears to fit conditions for the site. Hurricane Joaquin passed through the area on October 2-3 and low salinity persisted for weeks following the storm due to the high amount of rainfall in inland areas affecting the estuary.

12/01/2015 deployment, SpCond failed to pass post calibration within an acceptable range. There are portions of this data beginning around 12/15/2015 that are elevated. Data for the entire deployment were flagged as suspect.

Dissolved Oxygen
Dissolved oxygen dips occur often at this site and correlate with tidal cycles. These records were retained.

01/07/2015 deployment, dissolved oxygen did not pass post calibration within acceptable range. Values for the entire deployment were flagged as suspect.

02/01/2015 – 02/03/2015, values for dissolved oxygen dropped to zero intermittently and were rejected. This probe was slightly outside of acceptable range during post calibration. Aside from this data period, the values seem to fit conditions for the site and rest of deployment was flagged as suspect.

05/05/2015 deployment had lots of turbidity spikes. Some incidences of elevated turbidity were coupled with low dissolved oxygen values and occasional drops to zero. The following dissolved oxygen data were rejected as the zero readings were likely due to turbidity in excess of 1000 NTU: 5/11 12:30; 5/16 14:30; 5/17 12:45; 5/26 5:00; 5/28 23:45; 5/30 00 & 23:15; 6/1 14:30

06/19/2015 10:30, dissolved oxygen values dropped to zero as turbidity values were recorded in excess of 2000 NTU. Both turbidity and dissolved oxygen values were rejected.

08/05/2015 deployment, dissolved oxygen did not pass post calibration within acceptable range. Data flagged as suspect except the data affected by SpCond issues described below.

08/05/2015 deployment, SpCond/Salinity failure that resulted in rejected data for all parameters intermittently through 08/13/2015. Also a record at 08/06/2015 1:00 was zero and rejected.

09/02/2015 deployment, dissolved oxygen failed to pass post calibration within acceptable range. Data for the entire deployment was flagged as suspect.

09/16/2015 deployment, dissolved oxygen levels fluctuated and may have been associated with Hurricane Joaquin following October 2, 2015. Events when dissolved oxygen dropped to zero correlated to turbidity spikes and were rejected.

10/14/2015 deployment, some elevated turbidity values were flagged as suspect or rejected, cause unknown.

pH
02/04/2015 deployment, post calibration value in the 10 standard was outside of acceptable ranges and slope was borderline within acceptable range. Data for the entire deployment was flagged as suspect.

03/05/2015 deployment, elevated pH values were observed. This probe passed calibration and post calibration checks with acceptable values but may have been malfunctioning. The entire deployment was flagged as suspect.

05/05/2015 deployment, post calibration values were outside of acceptable ranges and slope was low. Data for the entire deployment was flagged as suspect.

06/02/2015 deployment, post calibration value in the 10 standard was outside of acceptable ranges and slope was low. Data for the entire deployment was flagged as suspect.

06/17/2015 deployment, post calibration value in the 10 standard was outside of acceptable ranges and slope was low. Data for the entire deployment was flagged as suspect.

07/07/2015 deployment, post calibration values were outside of acceptable ranges and slope was low. Data for the entire deployment was flagged as suspect.

07/21/2015 pH probe did not calibrate within acceptable ranges. Probe inventory was low and sonde was deployed with probe, also did not pass post calibration with acceptable ranges. Data for entire deployment was rejected.

08/05/2015 deployment, pH did not pass post calibration within acceptable range. Data rejected for entire deployment.

11/03/2015 deployment, pH failed to pass post calibration with acceptable values. From 11/03/2015 through 11/22/2015, data were flagged as suspect. From 11/23/2015 through the end of the deployment pH data were rejected.

12/01/2015 deployment, pH failed to pass post calibration within acceptable range for both the 7 and 10 standards. The slope was fine. There was mud caked on the sensor after retrieval from the field. Data for the entire deployment were flagged as suspect.

Turbidity

12/11/14 deployment (data from 01/01/15 – 01/07/15), turbidity failed to pass post calibration within acceptable range and it is possible that the standard was contaminated. There were lots of negative values and data for the entire deployment were rejected.

01/07/15 deployment, turbidity values were within acceptable range for post calibration, but data contained lots of negative values. The entire deployment was rejected due to QAQC checks.

03/05/15 deployment had lots of negative turbidity values. These were within the range of the sensor and the probe passed post calibration. Negative values were flagged as suspect.

04/08/2015 deployment, post calibration value was low and data for entire deployment flagged as suspect. If negative values were lower than -2, data was rejected.

05/05/2015 deployment had lots of turbidity spikes. Some incidences of elevated turbidity were coupled with low dissolved oxygen values. Turbidity spikes were flagged as suspect or rejected.

06/17/2015 deployment, turbidity data was flagged as suspect due to post calibration out of acceptable range. Values over 1000 NTU were rejected. The instrument was missing the turbidity wiper upon retrieval and had barnacle growing on the optic.

08/05/2015 deployment, SpCond/Salinity failure that resulted in rejected data for all parameters intermittently through 08/13/2015.

09/16/2015 deployment, elevated turbidity reading occurred during this deployment and some may have been associated with Hurricane Joaquin following October 2, 2015. These values were retained unless above the sensor specifications as periods of elevated turbidity may be associated with large storms. Some turbidity spikes also correlated with dissolved oxygen dropping to zero.

11/03 deployment, elevated values were flagged as suspect or rejected, cause unknown.

Zeke's Basin

General

This site is within a shallow lagoonal system and the sonde is subject to our of water events, especially at spring low tides.

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.

Data missing due to battery failures:
04/05/2015 02:00 - 04/06/2015 16:00
11/29/2015 06:30 - 12/01/2015 15:00

Data missing due to programming error: 01/01/2015 – 01/07/2015

Missing data due sonde swap:
02/04/2015 13:30
03/06/2015 12:15
07/20/2015 13:45

Out of water events are described in Depth section.

Accumulation of mud in the sonde deployment tube/guard resulted in rejected and suspect data for DO, Turbidity, and Chlorophyll. Mud began to 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. Affected data are flagged between
06/04/2015 00:45 - 06/27/2015 21:15
Some of the depressed DO may also be due to infestations of macroalgae.

Many parameters fluctuated following Hurricane Joaquin. The area received 12-15 inches of rainfall and the sounds and estuarine areas were significantly affected. Temperature, SpCond/Salinity, Dissolved Oxygen and pH values were lower following the storm and fresh water influence, while turbidity values increased during this time.

Depth

There were several times throughout the year where changes in barometric pressure affected the depth sensor resulting in negative depth data. The corrected depth parameter adjusts for changes in barometric pressure. Where the depth reading is negative before and after corrected, data were flagged -3 SOW. Where depth readings were positive before correction and negative after correction, data were flagged -3 SOW. Where depth readings were negative before correction and positive after corrected, data were flagged 1 SNV CAP.
02/20/2015 04:30 -02/20/2015 07:15 – A spike in depth data was recorded for this block of data. Values were impossibly high (as high as 22m) and data was rejected, cause unknown, but possibly due to a blocked sensor port. This is an isolated incident and surrounding data fits conditions.

Low tide exposing salinity contacts and other parameters unaffected. Data rejected <-3> (CLT)
02/23/2015 20:45
02/23/2015 21:00
Low tide exposing salinity contacts. Data rejected <-3> (CLT)
03/06/2015 04:30
03/06/2015 04:45 - 03/06/2015 05:45 All data rejected due to exposure.

SpCond/Salinity

Post calibration unacceptable for the following deployments
01/21/15
02/04/15

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 sensor affected by mud in guard. 06/08/2015 06:30 - <1> [SBO] (CMD) flagged as suspect.

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] (CSM).

Elevated data from 02/21/2015 19:15 – 03/06/2015 12:00 due to algal growth on sensor. Affected data rejected <-3> [SBO] (CBF)

Sensor failure occurred during the 06/02/2015 deployment. Values jump to around -20NTU. Affected data were flagged and rejected <-3> [SM] (CSM). Post calibration also unacceptable.

9/1/15 – 9/16/15 deployment contained multiple turbidity records <2NTU. Affected data rejected <-3> [SNV] (CCU).