# Apalachicola (APA) NERR Water Quality Metadata

**January – February 2014**

**Latest Update: February 11, 2016**

**I. Data Set & Research Descriptors**

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Apalachicola NERR

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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.

**3. Research objectives:**

The East Bay station collects water quality data associated with runoff from the Tate's Hell Swamp area. This area was ditched, diked, and altered back in the late 1960’s and early 1970’s by timber companies. It shortened the drainage period and allowed increased runoff with a concomitant increase in pH, which had a drastic affect on the biological communities in East Bay. Because of this some plugs were put in to slow drainage, but little restoration work was done. The Northwest Florida Water Management District purchased a large section, approximately 36,000 acres, in 1994. An EPA grant allowed them to begin restoration of the site in 1995 to reduce non-point source runoff. Positioning the dataloggers at the surface and bottom in East Bay allows the Reserve to monitor changes in water quality during this restoration effort. Cat Point and Dry Bar stations collect water quality data associated with the health of oysters. These stations are located on two of the most productive oyster beds in the bay. They were chosen as monitoring sites so that the health and ecological functions of these economically important oyster bars could be monitored continuously. Data from all sites are used to relate conditions in the bay to the amount of freshwater flow from the Apalachicola River.

**4. Research methods:**

The YSI monitoring program was started in April 1995 in association with the NERRS System Wide Monitoring Program (SWMP) effort. ANERR began monitoring three stations in the Apalachicola Bay system beginning in May 1992, using Hydrolab Datasonde 3’s. These stations continue to be monitored today using YSI 6600 EDS model sondes. The East Bay station consists of two sites, including, a sonde placed near the surface at this site and one located near the bottom sediment. Cat Point and Dry Bar are the other two stations located near two of the most productive oyster beds in Apalachicola Bay. Both Hydrolab and YSI dataloggers have been used at all stations interchangeably as required, however, only YSI 6600 EDS models were used to collect data from 2004 to present day. YSI 6600 V2 models were used to collect data at one site, Dry Bar, from 2010 to present day. Prior to deployment, YSI 6600 EDSs and V2s are calibrated for conductivity, dissolved oxygen, depth, turbidity and pH following the procedures outlined in the YSI Operating and Service Manual (with addendum 5/99) and the NERR SWMP YSI 6-Series Multi-Parameter Water Quality Monitoring Procedure SOP Version 4.1. Lab grade conductivity standards (Fisher Brand) are initially used to calibrate the YSIs, which are then used to check working standards made up and used for ongoing salinity calibration. Lab grade standards are also used periodically to check the accuracy of the working salinity standards.

The only variation from the manual is the use of two pH standards (pH 7 and pH 10) for two-point calibration of pH rather than three-point calibration. Beginning in July 2007, an optical dissolved oxygen sensor Model 6150 was also used at the East Bay Surface site only, so that both models 6150 and 6562 sensors were used at the East Bay Surface site during 2008. The membranes for the dissolved oxygen probe (model 6562) are installed at least 12 hours prior to calibration. Beginning January 31, 2006, depth has been set based on the barometric pressure the day of calibration. Prior to this, a default atmospheric pressure of 760 mmHg was used to calibrate the depth to 0 meters for pre- and post- calibration. Local pressure is measured using a Kestrel 4000 pocket weather tracker unit and the depth offset from zero meters is determined using the tables provided in the Water Quality SOP. A turbidity probe was added to the YSI 6000’s in December 1996. The model 6026 turbidity probe has been offered by YSI since 1995, but as of 2003 was no longer in use at ANERR. The Reserve began using the turbidity probe model 6136 in March 2002. These probes are given a two-point calibration to 0 NTU using deionized water, and to 126 NTU using YSI standard. Following calibration, a guard is attached to the datalogger to protect the probes. A piece of plastic mesh is placed in the bottom of the guard and another one is attached to the outside of the guard to discourage any creatures from getting to the probes and to minimize fouling. The sondes are then programmed to begin recording data at 03:59:00 AM morning of deployment. Data was collected by sondes at 30 minute intervals through 2006, when by CDMO directive the sondes began collecting data at 15-minute intervals (See section 15 for exact date and times). They are wrapped in damp white towels and placed in a 5-gallon bucket with water to sit overnight. The D.O. probe is re-calibrated before deployment and the sonde is checked to ensure that the instrument is working properly.

In 2001, the task of wrapping the sonde in a wet, white towel during transportation for deployment and retrieval became a part of the standardized procedure for YSI 6-series multi-parameter sondes. In 2013, this method was still used as an effective method of transporting. The sondes are also carried to the field using a large vented cooler and cushioned with styrofoam. During deployment and retrieval of the sondes, measurements of dissolved oxygen concentrations and percent saturation, salinity, and temperature, are taken at the sites using a hand-held YSI 85 instrument.

YSI 6600 EDS and V2 dataloggers are deployed on the same piling within a five-inch diameter stainless-steel tube with a locking cap. In order to maintain constant depth, the dataloggers are clamped to a PVC pipe and lowered into the tube. Large holes are cut in the tube where the probes are located to insure adequate water circulation. Every two to three weeks the dataloggers are retrieved, downloaded, cleaned, and inspected. Freshly calibrated units are deployed at the same time, resulting in little or no data gaps in collection intervals.

A Sutron Sat-Link2 transmitter was installed at the East Bay bottom station on 08/14/06 at 13:15 and transmits data to the NOAA GOES satellite, NESDIS ID #3B02D4E6. The transmissions are scheduled hourly and contain four (4) data sets reflecting fifteen minute data sampling intervals. Upon receipt by the CDMO, the data undergoes the same automated primary QAQC process detailed in Section 2 above. The “real-time” telemetry data become part of the provisional dataset until undergoing secondary and tertiary QAQC and assimilation in the CDMO’s authoritative online database. Provisional and authoritative data are available at [http://cdmo.baruch.sc.edu](http://cdmo.baruch.sc.edu/).

Remote Access Satellite Sensor Link (RASSL) telemetry units were installed at the Cat Point and Dry Bar sites, on 03/16/06 at 11:20 and on 05/09/06 at 12:05, respectively. The transmissions were scheduled hourly and contained one (1) dataset reflecting hourly data sampling intervals. The telemetry data is “Provisional” data and not the “Authentic” dataset used for long term monitoring and study. This data was uploaded to a privately accessible website, <https://www.sensorlink.biz>. Please contact the research coordinator for further information about these telemetry units. Due to lack of funding, these telemetry units stopped operating on January 14, 2008 and the Sensorlink website is no longer available.

**5. Site location and character:**

The Apalachicola National Estuarine Research Reserve is located in the northwestern part of Florida, generally called the panhandle. It is located adjacent to the City of Apalachicola, and encompasses most of the Apalachicola Bay system, including 52 miles of the lower Apalachicola River. Passes, both natural and manmade, connect Apalachicola Bay to the northeastern Gulf of Mexico.

East Bay is separated from Apalachicola Bay by two bridges and a causeway and is located to the north of the bay proper. East Bay is 8.2 km long, has an average depth of approximately 1.0 m MHW, and an average width of 1.8 km. The tides in East Bay are mixed and range from 0.3 m to 1.0 m (average 0.5 m). The sampling site is located in the upper reaches of East Bay. The original piling location was located at latitude 29°47.15’ N and longitude 84°52.52’ W. A new water quality monitoring tower was constructed directly adjacent to the original piling in June 2013. The East Bay Bottom and Surface data sondes were relocated to this new station on February 7, 2014. The tower location is at latitude 29°47.147’ N and longitude 84°52.512’ W. At the sampling site, the depth is 2.2 m MHW and the width of the bay is 1 km. The tides in the system are mixed; meaning the number of tides can range from one to five tides during a 24-hour period and are not evenly distributed throughout the day.

At the East Bay (EB) bottom site the meter probes are 0.3 m above the bottom sediment. Salinity ranges from 0 to 30 ppt and the long-term average salinity is approximately 8 ppt. At the East Bay surface (ES) site the meter probes are 1.7 m above the bottom sediment and salinity ranges from 0 ppt to 30 ppt with a long term average salinity of 6.3 ppt. The freshwater input is very tannic and usually dark colored. Flows vary with local rainfall and are not quantified due to the diverse sources of the runoff. The bottom habitat at this bay site is soft sediment, primarily silt and clay, with no vegetation present. The dominant marsh vegetation near the sampling site is *Juncus roemerianus* and *Cladium jamaicense*. The dominant upland vegetation is primarily pineland forest, which includes slash pine, saw palmetto, and sand pine. Upland land use near the sampling site includes conservation and silviculture uses with some single family residential in the lower East Bay area. The sampling site is influenced by local runoff from Tate's Hell Swamp, the East Bay marshes, and distributary flow, some of which comes from the Apalachicola River via the East River. Tate's Hell Swamp was ditched, diked, and altered back in the late 1960’s and early 1970’s by timber companies. These changes shortened the drainage period and allowed increased runoff with a concomitant decrease in pH and increase in color, which had a drastic affect on the biological communities in East Bay. Restoration of Tate's Hell Swamp began in 1995 to reduce non-point source runoff.

The Cat Point (CP) sampling site is located in St. George Sound, approximately 400 meters east of the St. George Island Bridge Causeway. The piling location is latitude 29°42.128′ N and longitude 84°52.811′ W. The tides at Cat Point are mixed and range from 0.3m to 1.0m (average 0.5m). At the sampling site, the depth is 2 to 3 m MHW and the width of the bay is 4 miles. The site was moved approximately 600 meters south in October 1997. At the Cat Point site the meter probes are 0.3 meters above the bottom sediment. Salinity ranges from 0 to 32 ppt. Flows vary with local rainfall and are not quantified due to the diverse sources of the runoff. The bottom type is oyster bar with no vegetation present except algae growing on the oysters in the summer. The dominant upland vegetation is primarily pineland forest, which includes slash pine, saw palmetto, and sand pine. Upland land use near the sampling site includes single-family residential and commercial use in the Eastpoint area. The sampling site is influenced by local runoff from Tate's Hell Swamp and flow from the Apalachicola River, which has the highest flow rate in Florida. High salinity water comes mainly from the east, through East Pass at the end of St. George Island.

The Dry Bar (DB) sampling site is located near St. Vincent Sound, in the western part of the Apalachicola Bay system, approximately one-half mile east of St. Vincent Island. The original piling location was located at latitude 29°40.48′ N and longitude 85°03.50′ W. A new water quality monitoring tower was constructed in June 2013. The Dry Bar data sonde was relocated to this new station on April 24, 2014. The tower location is at latitude 29°40.482’ N and longitude 85°03.502’ W. At the sampling site, the depth is 2 meters and the width of the bay is 7 miles. At the Dry Bar site the meter probes are located 0.3 meters above the bottom sediment. The tides are mixed and range from 0.3 to 1.0 meters. Salinity ranges from 0 to 34 ppt. The bottom type is oyster bar with no vegetation present, except algae that grow on the oysters during the summer months. The dominant upland vegetation includes slash pine flatwoods with various combinations of gallberry, smooth cordgrass, fetterbush, cabbage palm, saw palmetto, magnolia, and grasses. Upland use near the sampling site includes state owned and managed Cape St. George Island and St. Vincent National Wildlife Refuge, as well as single family residential and commercial use in the Apalachicola area. The sampling site is influenced from the flow of the Apalachicola River, which is monitored daily, and high salinity water entering West Pass and Sikes Cut via tidal action.

6. Data collection period:

The dataloggers were first deployed at the East Bay Surface site on April 17, 1995. East Bay bottom sampling began on May 1, 1995. Both have been continuously in service since then. Data from the two oyster bar stations, Cat Point and Dry Bar, has been collected since 1992. During the fourth quarter of 2013, all deployments utilized YSI 6600 EDS and V2 dataloggers. Deployment dates and times for the year of 2014 follows. See section 14 for details on sonde failures.

**Cat Point**

Deployment Retrieval

12/17/2013 10:45 1/11/2014 21:30

1/13/2014 11:45 2/10/2014 10:00

2/10/2014 10:45 2/25/2014 10:00

2/25/2014 11:00 3/11/2014 9:30

3/11/2014 9:45 4/1/2014 8:45

4/1/2014 9:15 4/22/2014 9:15

4/22/2014 9:30 5/6/2014 10:15

5/6/2014 10:45 5/21/2014 11:00

5/21/2014 11:15 6/4/2014 10:45

6/4/2014 11:15 6/20/2014 7:45

6/20/2014 8:00 7/2/2014 7:30

7/2/2014 8:00 7/17/2014 10:00

7/17/2014 10:15 8/6/2014 9:00

8/6/2014 9:30 8/20/2014 8:30

8/20/2014 10:00 9/3/2014 11:45

9/3/2014 10:00 9/23/2014 7:30

9/23/2014 7:45 10/7/2014 9:00

10/7/2014 9:30 10/28/2014 9:00

10/28/2014 9:15 11/13/2014 10:00

11/13/2014 10:30 12/11/2014 10:45

12/11/2014 11:00 1/6/2015 13:30

**Dry Bar**

Deployment Retrieval

12/17/2013 10:00 1/13/2014 9:15

1/13/2014 9:00 2/10/2014 12:00

2/10/2014 13:30 2/25/2014 9:45

2/25/2014 10:00 3/11/2014 8:15

3/11/2014 9:15 4/1/2014 10:00

4/1/2014 10:15 4/22/2014 8:00

4/22/2014 9:15 5/6/2014 12:00

5/6/2014 12:15 5/21/2014 7:45

5/21/2014 8:45 6/4/2014 8:15

6/4/2014 8:30 6/20/2014 10:45

6/20/2014 12:00 7/2/2014 12:15

7/2/2014 12:30 7/17/2014 12:30

7/17/2014 1:45 8/6/2014 11:45

8/6/2014 12:00 8/20/2014 9:00

8/20/2014 10:00 9/3/2014 11:45

9/3/2014 12:00 9/30/2014 8:45

9/30/2014 10:00 10/7/2014 12:00

10/7/2014 11:30 10/28/2014 10:30

10/28/2014 11:45 11/13/2014 11:45

11/13/2014 12:00 12/11/2014 11:30

12/11/2014 12:15 1/6/2015 9:30

**East Bottom**

Deployment Retrieval

12/17/2013 11:45 1/13/2014 11:45

1/13/2014 12:15 2/10/2014 10:45

2/10/2014 11:30 2/25/2014 11:15

2/25/2014 11:30 3/11/2014 10:15

3/11/2014 11:00 4/1/2014 8:15

4/1/2014 8:30 4/22/2014 10:00

4/22/2014 10:45 5/6/2014 9:15

5/6/2014 9:30 5/21/2014 14:30

5/21/2014 15:15 6/4/2014 13:30

6/4/2014 13:45 6/11/2014 2:15

6/20/2014 13:15 7/2/2014 13:45

7/2/2014 14:15 7/17/2014 2:30

7/17/2014 16:00 8/6/2014 9:15

8/6/2014 9:30 8/20/2014 9:00

8/20/2014 9:15 9/3/2014 9:00

9/3/2014 9:15 9/23/2014 9:15

9/23/2014 9:30 10/7/2014 8:30

10/7/2014 9:30 10/28/2014 9:00

10/28/2014 8:45 10/30/2014 12:15

10/30/2014 13:15 11/13/2014 10:15

11/13/2014 10:30 12/11/2014 10:15

12/11/2014 10:30 1/6/2015 14:00

**East Surface**

Deployment Retrieval

12/17/2013 11:30 1/13/2014 11:45

1/13/2014 12:00 2/10/2014 10:15

2/10/2014 11:45 2/25/2014 11:00

2/25/2014 11:15 3/11/2014 9:45

3/11/2014 11:00 4/1/2014 8:00

4/1/2014 8:15 4/22/2014 9:30

4/22/2014 10:45 5/6/2014 9:15

5/6/2014 9:30 5/21/2014 14:00

5/21/2014 15:15 6/4/2014 13:15

6/4/2014 13:30 6/20/2014 12:45

6/20/2014 13:00 7/2/2014 13:15

7/2/2014 13:30 7/17/2014 14:00

7/17/2014 15:00 8/6/2014 7:45

8/6/2014 8:00 8/20/2014 7:15

8/20/2014 9:15 9/3/2014 7:45

9/3/2014 8:00 9/23/2014 8:00

9/23/2014 9:00 10/7/2014 8:30

10/7/2014 9:30 10/28/2014 17:15

10/28/2014 17:30 11/13/2014 9:30

11/13/2014 9:45 12/11/2014 9:30

12/11/2014 10:45 1/6/2015 14:30

**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 2012.

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

8. Associated researchers and projects:

As part of SWMP and in addition to this Water Quality monitoring dataset, APA NERR also monitors Meteorological and Nutrient data. These data are also available from the Research Coordinator or online at http://cdmo.baruch.sc.edu/.

APA NERR has been monitoring water quality at three stations in Apalachicola Bay since May of 1992, with the use of Hydrolab Datasondes and YSI 6000-series model sondes. One of these stations was moved from the mid-bay area near the Intracoastal Waterway to the East Bay bottom site in January of 1993. The other two are located on two of the largest commercially important oyster bars in the bay. These stations, like East Bay, are intended to be long-term. Other associated researchers and projects, which have in the past, or continue to utilize this water quality data, are:

Northwest Florida Water Management District

Tate’s Hell Restoration Project

Apalachicola Bay Freshwater Needs Study

Central Panhandle Aquatic Preserve, Water Quality Monitoring project

State of Florida, ACF “Water Wars.”

Bedoya, P. /University of Florida, Dept. of Fisheries and Aquatic Sciences

Phytoplankton composition and abundance in relation to nutrients, salinity and hydrodynamics within the Apalachicola National Estuarine Research Reserve

Byars, N. /Florida State University.

How does climatic- and human-induced variability in river flow affect the spatial-temporal distribution of phytoplankton and their subsequent availability to oysters in Apalachicola Bay, Florida?

Caffrey, J. /University of West Florida

Development of an in situ instrument for measuring nitrogen in natural waters.

Chanton, J./ Florida State University, Department of Oceanography

Food Web Relationships Utilizing Stable Isotope Ratios.

Childs, C./Florida State University, Dept. of Oceanography.

A spatial and temporal assessment of factors affecting denitrification in Apalachicola Bay.

Dean, B., Wanat, J., Stewart, J., and Edmiston, H.L. / Apalachicola National Estuarine Research Reserve. Growth and spat recruitment related to environmental conditions at oyster bars in Apalachicola Bay.

Donatto Surratt/Florida A&M University

Compare and contrast the historic and current trophic status of Apalachicola Bay using stable isotopes in sediments.

Dulaiova, H. / Florida State University, Dept. of Oceanography.

Determination of the distribution and volume of groundwater entering Apalachicola Bay from St. George Island.

Edmiston, H.L., Lewis, G., Wanat, J., Levi, L., Miller, K., Stewart, J. /Apalachicola National Estuarine Research Reserve.

Distribution and density of fishes and benthic invertebrates in Apalachicola Bay.

Iverson, R., Mortazavi, B./ Florida State University, Department of Oceanography

c-14 Primary Productivity

Nutrient Enrichment

Moss, A. / Auburn University.

Ctenophore physiology, and species composition in Apalachicola Bay.

Niu, X./ Florida State University, Department of Statistics

Edmiston, H.L., Bailey, G.O./ APA NERR

Time Series Models for Salinity and Other Environmental Factors in the Apalachicola Estuarine System (1998). Estuarine, Coastal, and Shelf Science 46:549-563.

Petes, L./Florida State University

The effect of temperature and salinity on Apalachicola oyster survival, growth, condition, and disease

Prasad, A.K.S.K, Wise, S.W./ Florida State University.

Gauging the effects of the BP Oil Spill on diatoms, calcareous nanoplankton, and related protists at or near the base of the food chain in the NE Gulf of Mexico.

Putland, J. / Florida State University, Dept. of Oceanography.

Planktonic food web variations related to salinity and nutrient patterns in Apalachicola Bay.

Smith, S./Florida A&M University

Drought, reduced river flow and sea level rise: exploring climate impacts on carbon and nitrogen cycling in the Apalachicola Bay system

Tamplin, M. L., et.al./ Univ. of Florida, Institute of Food and Agricultural Sciences

Association of Multiple-Antibiotic-Resistance Profiles with Point and Nonpoint Sources of *Escherichia coli* in Apalachicola Bay

Taylor, M.A./ Florida State University

Effects of River Flow on Juvenile Fish Nursery habitat Function: Developing an Ecosystem Perspective.

Wilber, P., et. al./NOAA Coastal Services Center & Edmiston, L., et al./Apalachicola National Estuarine Research Reserve

Benthic habitat mapping in Apalachicola Bay

**9. Sensor specifications:**

The Apalachicola NERR deployed 6600 EDS and V2 data sondes in 2013. In 2011, rapid-pulse DO sensors were deployed at CP and EB and ROX DO sensors were continuously deployed at sites ES and DB. Beginning April 2012, ROX DO sensors are deployed at all four sites.

YSI 6600 EDS or V2 data sonde:

Parameter: Temperature

Units: Celsius (ºC)

Sensor Type: Thermistor

Model #: 6560

Range: -5 to 50 ºC

Accuracy: +/-0.15ºC

Resolution: 0.01ºC

Parameter: Conductivity

Units: milli-Siemens per cm (mS/cm)

Sensor Type: 4-electrode cell with autoranging

Model #: 6560

Range: 0 to 100 mS/cm

Accuracy: +/-0.5% of reading + 0.001 mS/cm

Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependant)

Parameter: Salinity

Units: parts per thousand (ppt)

Sensor Type: Calculated from conductivity and temperature

Model #: 6560

Range: 0 to 70 ppt

Accuracy: +/-1.0% of reading or 0.1ppt, whichever is greater

Resolution: 0.01ppt

Parameter: Dissolved Oxygen % saturation

Units: percent air saturation (%)

Sensor Type: Rapid Pulse – Clark type, polarographic

Model #: 6562

Range: 0 to 500 % air saturation

Accuracy: 0-200 % air saturation, +/-2% of the reading or 2% air saturation (whichever is greater); 200-500 % air saturation, +/-6% of reading

Resolution: 0.1% air saturation

or

Sensor Type: Optical probe with mechanical cleaning

Model#: 6150 ROX

Range: 0 to 500% air saturation

Accuracy: 0-200% air saturation: + / -1% of the reading or 1% of air saturation, whichever is greater

200-500% air saturation: + / - 15% of reading

Parameter: Dissolved Oxygen mg/L (calculated from DO%, temperature and salinity)

Units: milligrams per Liter (mg/L)

Sensor Type: Rapid Pulse-Clark type, polargraphic

Model #: 6562

Range: 0 to 50 mg/L

Accuracy: 0 to 20 mg/L, +/-2% of the reading or 0.2 mg/L (whichever is greater); 20 to 50 mg/L, +/-6% of the reading

Resolution: 0.01 mg/L

or

Units: milligrams/Liter (mg/L)

Sensor type: Optical probe with mechanical cleaning

Model#: 6150 ROX

Range: 0 to 50 mg/L

Accuracy: 0-20 mg/L; +/-0.1 mg/L or 1% of the reading, whichever is greater; 20 to 50 mg/L; +/- 15% of the reading

Resolution: 0.01 mg/L

Parameter: Non-Vented Level – Shallow (depth)

Units: feet or meters (ft or m)

Sensor Type: Stainless steel strain gauge

Range: 0 to 30 ft (9.1m)

Accuracy: +/- 0.06 ft (0.018m)

Resolution: 0.001 ft (0.001m)

Parameter: pH EDS

Units: pH units

Sensor Type: Glass combination electrode

Model #: 6561

Range: 0 to 14 units

Accuracy: +/- 0.2 units

Resolution: 0.01 units

Parameter: Turbidity

Units: nephelometric turbidity units (NTU)

Sensor Type: Optical, 90º scatter, with mechanical cleaning

Model #: 6136

Range: 0 to 1000 NTU

Accuracy: +/- 2% reading or .3 NTU (whichever is greater)

Resolution: 0.1 NTU

**Dissolved Oxygen qualifier:**

The reliability of the dissolved oxygen (DO) data after 96 hours post-deployment for non-EDS (Extended Deployment System) data sondes may be problematic due to fouling which forms on the DO probe membrane during some deployments (Wenner et al. 2001). Many reserves have upgraded to the YSI 6600 EDS data sondes, which increases DO accuracy and longevity by reducing the environmental effects of fouling. The user is therefore advised to consult the metadata and exercise caution when utilizing the DO data beyond the initial 96-hour time period. However, this potential drift is not always problematic for some uses of the data, i.e. periodicity analysis. It should also be noted that the amount of fouling is very site specific and that not all data are affected. The Research Coordinator at the specific NERR site should be contacted concerning the reliability of the DO data because of the site and seasonal variation in the fouling of the DO sensor. YSI 6600 EDS datasondes were used at three Apalachicola Bay stations: Cat Point, East Bay Bottom and East Bay Surface during the 2013 sampling year. YSI 6600 V2 datasondes were used at one Apalachicola Bay station, Dry Bar, during the 2013 sampling year.

**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 1.03 cm for every 1 millibar change in atmospheric pressure, and is eliminated for vented sensors because they are vented to the atmosphere throughout the deployment time interval.

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

In 2010, the CDMO began automatically correcting depth/level data for changes in barometric pressure as measured by the Reserve’s associated meteorological station during data ingestion. These corrected depth/level data are reported as cDepth and cLevel, and are assigned QAQC flags and codes based on QAQC protocols. Please see sections 11 and 12 for QAQC flag and code definitions.

**10. Coded variable definitions:**

Raw file naming protocol: 4-numeral deployment sitename/date of deployment/month (e.g. Cat0103 = Cat Point deployment beginning January 3, 2008).

Pre-processed file naming protocol: YSI deployment site/month/day (e.g. CP0103 = Cat Point data from deployment starting January 3, 2007).

Site definitions:

**Sampling Station: Sampling site code: Station code:**

Cat Point CP apacpwq

Dry Bar DB apadbwq

East Bay Bottom EB apaebwq

East Bay Surface ES apaeswq

**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**

End of deployment Post-calibration Readings in Standard Solutions:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Deployment Date | DO% | Depth (m) | SpCond (mS/cm) | pH | Turb(NTU) |
|  | (Std: 100%) | (Std: varies) | (Std: 50@25°) | (Std: 7) | (Std: 0) |
| **Cat Point** |  |  |  |  |  |
| 1/13/2014 | 99.8 | 0.041 | 45.72 | 7.31 | 1.1 |
| 2/10/2014 | 88.9 | 0.009 | 46.1 | 7.15 | 1.7 |
| 2/25/2014 | 100.1 | -0.017 | 47.15 | 7.14 | 2.3 |
| 3/11/2014 | 99.5 | 0.076 | 45.79 | 7.11 | 7.4 |
| 4/1/2014 | 99.6 | 0.018 | OOR | 7.31 | 1 |
| 4/22/2014 | 92 | 0.036 | 48.18 | 7.1 | 1.5 |
| 5/6/2014 | 97 | 0.081 | 42.16 | OOR | 0.6 |
| 5/21/2014 | OOR | 0.03 | 46.08 | 7.43 | 0.9 |
| 6/4/2014 | 101.8 | 0.034 | 51.04 | 7.04 | 0.1 |
| 6/20/2014 | 101.2 | -0.002 | 50.85 | 7.06 | 0.3 |
| 7/2/2014 | 101.5 | 0.021 | 49.19 | 7.01 | 0.7 |
| 7/17/2014 | 100.8 | 0.022 | 46.63 | 7.74 | 9.6 |
| 8/6/2014 | 98.7 | 0.048 | 53.23 | 7.06 | 0.2 |
| 8/20/2014 | 95.4 | 0.036 | 47.28 | 7.12 | OOR |
| 9/3/2014 | 98.6 | 0.036 | 52.05 | 7.22 | -0.2 |
| 9/23/2014 | 100.8 | 0.026 | OOR | 7.08 | -0.1 |
| 10/7/2014 | 133.9 | 0.066 | 51.08 | 6.94 | 0 |
| 10/28/2014 | 100.3 | 0.035 | 46.43 | 7.34 | -0.5 |
| 11/13/2014 | 101.9 | 0.064 | 44.61 | 6.93 | 0.9 |
| 12/11/2014 | 101.1 | 0.1 | 42.57 | 7.88 | -11.9 |
|  |  |  |  |  |  |
| Deployment Date | DO% | Depth (m) | SpCond (mS/cm) | pH | Turb(NTU) |
|  | (Std: 100%) | (Std: varies) | (Std: 50@25°) | (Std: 7) | (Std: 0) |
| **Dry Bar** |  |  |  |  |  |
| 1/13/2014 | OOR | 0.044 | OOR | 7.57 | -0.4 |
| 2/10/2014 | 100.2 | 0.034 | 49.83 | 7.14 | 13.5 |
| 2/25/2014 | 97.9 | -0.026 | 46.54 | 7.13 | 3 |
| 3/11/2014 | 99.2 | 0.08 | 47.34 | 7 | 7.6 |
| 4/1/2014 | 96.6 | -0.034 | OOR | 6.76 | 3.4 |
| 4/22/2014 | 100.1 | 0.034 | 50.93 | 6.99 | 0.9 |
| 5/6/2014 | 100.8 | 0.085 | 51.44 | 6.98 | 1.2 |
| 5/21/2014 | 100.2 | 0.014 | 50.15 | 7.04 | -0.6 |
| 6/4/2014 | 100.5 | 0.041 | 48.6 | 7.12 | 0.5 |
| 6/20/2014 | 78.5 | -0.003 | 49.73 | 6.99 | -0.2 |
| 7/2/2014 | 101.2 | 0.01 | 48.42 | 6.9 | 0.2 |
| 7/17/2014 | 98.6 | 0.017 | 48.95 | 7.24 | -0.1 |
| 8/6/2014 | 101.2 | 0.044 | 49.6 | 7.16 | 1.8 |
| 8/20/2014 | 71.6 | 0.019 | 48.98 | 7.15 | 0.4 |
| 9/3/2014 | 99.9 | -0.033 | ORR | 7.12 | 0 |
| 9/23/2014 | 99.2 | 0.051 | 50.68 | 6.99 | 0.6 |
| 10/7/2014 | 102.9 | 0.05 | 49.94 | 6.95 | 0.2 |
| 10/28/2014 | 102.2 | 0.026 | 46.84 | 6.99 | 1 |
| 11/13/2014 | 99.6 | 0.079 | 50.18 | 7.08 | 0.2 |
| 12/11/2014 | 102.8 | 0.104 | 48.31 | 7.08 | -0.5 |
|  |  |  |  |  |  |
| Deployment Date | DO% | Depth (m) | SpCond (mS/cm) | pH | Turb(NTU) |
|  | (Std: 100%) | (Std: varies) | (Std: 50@25°) | (Std: 7) | (Std: 0) |
| **East Bottom** |  |  |  |  |  |
| 1/13/2014 | 100.7 | 0.054 | 48.22 | 7.15 | 2.7 |
| 2/10/2014 | 99.3 | 0.018 | 50.62 | 7.02 | 0.7 |
| 2/25/2014 | 99.2 | -0.015 | 48.24 | 7.3 | 0.2 |
| 3/11/2014 | 101.6 | 0.077 | 50.76 | 6.96 | 2.6 |
| 4/1/2014 | 100.1 | -0.002 | 47.8 | 7.15 | 3.6 |
| 4/22/2014 | 101 | 0.027 | 50.91 | 6.87 | 3.3 |
| 5/6/2014 | 101.6 | 0.094 | 47.34 | 7.41 | -0.5 |
| 5/21/2014 | 102 | 0.01 | 50.01 | 7.05 | -0.02 |
| 6/4/2014 | 99.6 | 0.033 | 49.01 | 7.27 | -0.4 |
| 6/20/2014 | 86.5 | 0.002 | 50.96 | 7.25 | 0.1 |
| 7/2/2014 | 100.2 | 0.056 | 49.25 | 7.49 | -0.3 |
| 7/17/2014 | 100.5 | 0.02 | 50.2 | 7.37 | 2.8 |
| 8/6/2014 | 98.8 | 0.051 | 51.99 | 7.32 | -0.6 |
| 8/20/2014 | 70.9 | 0.026 | 51.95 | 7.12 | 2.5 |
| 9/3/2014 | 99.9 | 0.043 | 51.45 | 7.41 | 0.5 |
| 9/23/2014 | 99.8 | 0.05 | 49.2 | 6.99 | 0 |
| 10/7/2014 | 100.8 | 0.074 | 49.68 | 7.27 | 0.2 |
| 10/28/2014 | 101 | 0.017 | 47.76 | 7.19 | -2.9 |
| 10/30/2014 | 99.5 | 0.031 | 47.86 | 7.12 | 0 |
| 11/13/2014 | 101.6 | 0.082 | 51.18 | 7.05 | 0.7 |
| 12/11/2014 | 90.6 | 0.088 | OOR | 7.11 | -0.1 |
|  |  |  |  |  |  |
| Deployment Date | DO% | Depth (m) | SpCond (mS/cm) | pH | Turb(NTU) |
|  | (Std: 100%) | (Std: varies) | (Std: 50@25°) | (Std: 7) | (Std: 0) |
| **East Surface** |  |  |  |  |  |
| 1/13/2014 | 102.9 | 0.055 | 48.05 | 7.12 | -0.3 |
| 2/10/2014 | 99.4 | 0.028 | 50.94 | 7.04 | 3.4 |
| 2/25/2014 | 99.8 | -0.029 | 48.07 | 7.01 | 2.6 |
| 3/11/2014 | 99.4 | 0.078 | 49.78 | 7.02 | 2.3 |
| 4/1/2014 | 100.5 | -0.02 | 48.01 | 7.05 | 5.1 |
| 4/22/2014 | 99.5 | 0.039 | 50.9 | 7.07 | 4.2 |
| 5/6/2014 | 98.3 | 0.081 | 48.65 | 7.04 | -0.5 |
| 5/21/2014 | 101 | 0.007 | 49.78 | 7.32 | 0.1 |
| 6/4/2014 | 99.7 | 0.026 | 50.16 | 7.14 | -0.7 |
| 6/20/2014 | 75.4 | 0 | 51.02 | 7.24 | 0.1 |
| 7/2/2014 | 101.6 | 0.054 | 48.27 | 7.01 | 0.5 |
| 7/17/2014 | 98.8 | 0.019 | 49.98 | 7.29 | 2.3 |
| 8/6/2014 | 99.6 | 0.047 | 51.94 | 7.13 | -1.4 |
| 8/20/2014 | 51.6 | 0.029 | 47.6 | 7.15 | 0.9 |
| 9/3/2014 | OOR | 0.038 | 50.2 | 7.14 | -1 |
| 9/23/2014 | 99.9 | 0.031 | 49.84 | 7.12 | -0.7 |
| 10/7/2014 | \* | \* | \* | \* | \* |
| 10/28/2014 | 99.3 | 0.032 | 47.21 | 7.21 | 0 |
| 11/13/2014 | 101.7 | 0.075 | 49.76 | 7.2 | -0.7 |
| 12/11/2014 | 101.4 | 0.095 | 50.91 | 7.24 | 0.2 |

\*Did not log.

**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.

The Apalachicola-Chattahoochee-Flint (ACF) River Basin experienced a “dry” year in regards to rainfall for 2011. For 2012 we were in a La Nina, which had resulted in dry conditions for 2012 and part of 2013. From 2/27/2013-3/4/2013, the Apalachicola River’s discharge was above 100,000 cubic feet per second (cfs), and considered to be at a flood stage. In April 2013, the ACF River Basin was no longer experiencing drought conditions. In 2014, from 4/9/2014-4/12/2014 and 4/21/2014-4/22/2014 the Apalachicola River’s discharge was above 100,000 cubic feet per second (cfs).

**Cat Point**

* There were multiple SpCond posts throughout the year that were out of range. These seem to be the result of sensor drift with no other factors present. The deployment affected and their posts are included below
  + 1/13 45/50
  + 2/10 46/50
  + 2/25 47/50
  + 3/10 45/50
  + 4/1 45/50
  + 5/6 42.16/50
  + 5/21 46/50
  + 7/17 46.63/50
  + 9/6 53/50
  + 10/28 46/50
  + 11/13 44/50
* 01/01/2014 9:00 -1/11/2014 21:30 Salinity is suspect due to many spikes and noisy data. This could be due to OOR post-cal and barnacles on the probe’s thermistor and contacts.
* 01/06/2014 11:45 -01/07/2014 5:30 Turbidity spikes due to rain
* 01/11/2014 21:45 -01/13/2014 11:30 Missing data due to the sonde no longer recording due to power loss.
* 01/13/2014 11:45-02/10/2014 10:00 Suspect pH values OOR post-cal and last readings inconsistent with handheld readings
* Turbidity spikes due to rain
  + 2/12 3:45-6:00, 9:15-15:30
  + 2/12 19:15-2/13 00:30
  + 2/13 5:30-11:15
* 02/18/2014 17:15-18:30 Suspected high DO values, >120%
* 03/06/2014 3:00-8:45Turbidity spikes due to rain
* 03/17/2014 2:00-4:00, 5:45-6:30 Small turbidity spikes due to rain
* Turbidity spikes due to rain and river discharge
  + 4/7 16;15-20:15
  + 4/8 1:45-2:45
  + 4/8 5:15-4/9 11:15
  + 4/15 8:15-4/16 20:00
  + 4/17 00:45
  + 4/18 18;00
  + 4/18 22:30-4/19 3:30
* 04/07/2014-04/08/2014 Turbidity spikes due to rain
* 04/08/2014-04/09/2014 Turbidity spikes probably due to river discharge – flood stage
* 04/15/2014-04/19/2014 Turbidity spikes increase in numbers due to rain, high river discharge, and wind; Rejected values >150 NTU
* 04/17/2014-04/19/2014 Suspect pH, large increase then big dip. Low slope for post-cal. Barnacle on bulb
* Small turbidity spikes probably due to river discharge
  + 4/22 6:15-17:45
  + 4/23 17:45-19:30
  + 4/25 7:15-9:00
  + 4/25 17:00-4/26 00:15
  + 4/26 9:00-11:00
  + 4/26 20:45-4/27 00:00
* Small turbidity spikes probably due rain
  + 4/28 22:00-4/29 1:45
  + 4/29 10:30-13:45, 11:15-13:00
* 05/06/2014 10:45-05/21/2014 11:00 Suspect pH values barnacle on bulb, OOR post-cal for both pH 7 and 10, last readings inconsistent with handheld readings
* 05/07/2014-05/08/2014; 05/19/2014-05/20/2014 Hypoxic DO events
* 05/07/2014-05/09/2014; 05/16/2014 Higher river discharge (68000-50000 ft3/sec) reduced salinity
* Small turbidity spikes due to rain and river discharge
  + 5/19 19:00-15
  + 5/16 20:00-22:30
* Turbidity spikes possibly due to wind
  + 5/22 17:45-20:15
  + 5/23 15:30-20:30
* 05/21/2014 11:15-06/04/2014 10:45 Suspect DO, post calibration out of range, disjointed data, first and last readings inconsistent with handheld readings
* 05/28/2014; 05/30/2014; 06/03/2014 Hypoxic DO events
* Turbidity spikes rejected, >1000 NTU, noisy
  + 5/29 17:30, 20:00-6/4 10:45
* 06/15/2014-06/20/2014 Turbidity spikes rejected, 785-1200 NTU
* 06/20/2014 6:45-7:45 Suspect pH values for end of deployment, inconsistent with handheld readings
* Suspect small Turbidity spikes possibly due to rain, river discharge, and/ or wind resuspension
  + 6/21 16:45-19:15
  + 6/26 19:30-20:30
  + 7/1 5:00-7:45
* 07/01/2014 15:30-22:30 Turbidity spikes rejected, 200-700 NTU, possibly due to rain
* 07/02/2014 8:00-07/17/2014 1:00 Turbidity data rejected >150 spikes (Noisy)
* 07/06/2014-07/08/2014 Hypoxic DO events
* 07/17/2014 @10:00 Reject DO% data, disjunction between deployments, and significant difference between sonde readings and handheld readings
* 08/03/2014 5:15-08/06/2014 9:00 Turbidity spikes rejected >150 spikes (Noisy)
* 08/06/2014-08/07/2014; 8/15/2014; 8/18/2014 Hypoxic DO events
* Suspect Turbidity spikes could be due to rain, river discharge, and/ or wind resuspension
  + 8/11 20:45-21:30
  + 8/11 22:45-8/12 00:45
  + 8/12 21:30-8/13 1:15
* 08/20/2014 10:00-09/03/2014 9:45 Logger failed to start logging
* 09/14/2014 11:30-19:15 Suspect Turbidity spikes could be due to wind
* 09/17/2014-9/19/2014 Hypoxic DO events
* 09/19/2014 12:45-09/23/2014 7:30 Reject Turbidity data due to Bio fouling, tunicate on wiper and 2 barnacles on sensor face
* 10/07/2014 9:30-10/28/2014 9:00 Reject DO data, >120%, DO post calibrated high at 133% and disjointed data, first and last readings inconsistent with handheld readings
* 10/14/2014 10:30-10/15/2014 22:15 Significant Rain Event
* Turbidity Spikes possibly due to wind and river discharge
  + 10/19 11:45-12:30
  + 10/26 10:00, 19:45-20:00
* 10/28/2014 9:00-11/13/2014 10:00 Reject pH data, first and last readings inconsistent with handheld readings, inconsistent with other deployments, the slope at the post was 150.2.
* Turbidity spikes possibly due to low tide, high winds (15-35 mph), and river discharge which corresponds with the drop in salinity
  + 11/1 2:30-19:30, 22:15-45
  + 11/2 00:30-11:45, 16:45
* Turbidity spikes due to rain, river discharge, and/ or wind resuspension
  + 11/17 18:00-19:45, 20:45-21:45
  + 11/18 5:00-30, 7:15-10:15, 12:15-45
  + 11/22 18:30-21:00
  + 11/24 10:00-11:45
  + 11/25 22:30-11/26 5:30
  + 12/10 10:00-11:45
* 12/11/2014 11:00-12/31/2014 23:45 Reject pH data, first and last readings inconsistent with handheld readings, post calibration out of range, doesn’t match other deployments
* 12/11/2014 11:00-12/31/2015 23:45 Reject all Turbidity data sensor malfunction
* 12/21/2014 00:00-12/31/2015 23:45 Suspect all data due to Biofouling

**Dry Bar**

* 01/01/2014 11:45 – 01/13/2014 8:45 Rejected turbidity data due to increase in values and spikes till the end of deployment. Barnacles on sensor.
* Suspected high DO values, >120%
  + 1/20 13:15-14:00, 20:15-23:15
  + 1/20 23:45-1/21 00:15
  + 1/21 00:45-1:45, 2:30, 5:15-30, 12:15
  + 1/23 21:30-22:15
  + 1/24 00:15-1:00
  + 1/24 23:45-1/25 1:30
  + 1/25 2:00, 10:45-12:00, 12:45-13:30
  + 1/26 00:00, 13:45—14:15
  + 1/27 11:15-12:15, 15:30-45, 16:15-17:15
  + 1/27 23:15-1/28 00:15
  + 1/28 2:30-3:00
  + 2/2 19:30-20:00
  + 2/10 13:45-15:00, 15:30-21:30, 23:15
  + 2/11 4:45-7:15, 8:00, 11:45, 12:15-21:30, 23:15
  + 2/14 15:15-22:00, 22:30
  + 2/15 10:00-45, 13:15-19:30
  + 2/15 21:00-2/16 00:45
  + 2/16 9:00-10:45, 11:15-2/17 1:00
  + 2/17 1:45-2:00, 2:30-4:45, 5:15-2/18 00:15
  + 2/18 1:30-5:00, 5:30-2/19 00:15
  + 2/19 00:45-1:45, 2:45-3:00, 3:30-8:30, 9:30-11:30, 12/:00-2/20 1:00
  + 2/20 10:00, 17:30-45, 19:45-20:00, 21:00-23:45
  + 2/21 00:30
  + 3/10 17:15
  + 4/10 15:00 -16:30
  + 4/11 19:00-15
  + 4/23 16:30-18:00, 19:15-45, 20:15
  + 6/4 16:00
  + 6/5 13:15-14:30, 15:00, 15:30-16:15, 16:45-17:30, 18:30, 20:00-30
  + 6/12 19:15-30
  + 6/20 15:00-30
  + 6/22 17:45
  + 10/28 15:15
  + 10/31 14:30
  + 11/4 14:45, 15:45-16:30, 17:30-19:30
  + 11/5 1:00, 15:00, 15:30-22:15
  + 11/6 3:30-5:00, 8:30, 11:15-45, 12:30-14:00, 17:00, 19:00, 19:30
  + 12/9 14:30-15:45
  + 12/13 14:00, 15:15-30
  + 12/15 14:45-15:15, 26:45-16:00, 16:45, 17:15-18:00
  + 12/16 1:45-3:15, 15:30-17:15
* 04/05/2014; 04/15/2014 Hypoxic DO events
* 04/03/2014 Turbidity spike rejected because value >150 NTU
* 04/07/2014 2:30-04/08/2014 5:00 Turbidity spikes due to rain, river discharge, and/ or wind resuspension
* 04/08/2014 12:30-04/09/2014 18:30 Turbidity spikes increase in numbers probably due to river discharge – flood stage and/ or wind, Rejected values >150 NTU
* 04/14/2014 18:30-04/19/2014 17:45 Turbidity spikes increase in numbers probably due to rain and river discharge – flood stage and/ or wind Rejected values >150 NTU
* 04/17/2014 8:30-04/20/2014 11:30 pH suspect, large increase then big dip. Low slope for post-cal Barnacles on bulb
* 04/24/2014 From 09:15-10:15 Data Logger out of water for tower construction reject all data
* 04/28/2014 22:15-05/01/2014 10:30Turbidity spikes due to rain, river discharge, and/ or wind resuspension
* 05/06/2014-05/08/2014; 06/14/2014; 06/19/2014; 06/20/2014 Hypoxic DO events
* Small turbidity spike because of river discharge
  + 5/9 14:00-16:45, 18:30-19:30
* Turbidity spikes due to rain, river discharge, and/ or wind resuspension
  + 5/13 2:30-3:00
  + 5/15 16:45-17:30
* 05/21/2014 8:45-05/23/2014 9:30 Suspect all data sonde at wrong depth
* 06/01/2014 21:00-06/02/2014 16:00 Turbidity spikes rejected values >150 NTU possibly due to rain, river discharge, and/ or wind resuspension
* 06/16/2014 5:00 Turbidity spikes rejected, 792 NTU possibly due to rain, river discharge, and/ or wind resuspension
* 07/04/2014 23:00 -07/05/2014 4:00 All data rejected during battery spikes
* 07/06/2014;07/07/2014; 07/14/2014; 07/15/2014 Hypoxic DO events
* Suspect high conductivity readings, correspond with salinity values unlikely for an estuary, cause unknown
  + 7/15 5:00, 5:30, 6:15
  + 8/10 12:45-14:15
* 07/22/2014; 07/23/2014; 07/25/2014-07/26/2014; 08/04/2014; 08/06/2014 Hypoxic DO events
* Low pH readings correspond with hypoxic DO events
  + 7/14 8:15-9:00
  + 7/15 5:45-8:15
  + 9/1 23;45-9/2 00:30
  + 9/2 1:00-45, 7:00-15, 7:45-8:00, 10:45-11:00, 18:00-45, 19:15-20:45
  + 9/3 00:00-2:45, 4:30
  + 9/30 22:45
  + 10/1 00:15
  + 10/2 1:30-2:15, 2:45, 8:00
  + 10/3 6:00-15, 15:15-30
* 07/17/2014 13:45-08/06/2014 11:45 All DO % and DO mg/L data suspect, unclear when wiper fell off during deployment
* 08/06/2014 12:00-08/20/2014 9:00 Suspect pH reading higher than previous and following deployments
* 08/06/2014; 08/09/2014 Hypoxic DO events
* 09/01/2014-09/03/2014 Hypoxic DO events
* 09/01/2014 8:15 Rejected Turbidity spike because >150 NTU
* 09/03/2014 Deployment remained deployed till 9/30/2014 due to heavy winds
* 09/03/2014 12:00-09/30/2014 8:45Reject all data; Conductivity failure, OOR post cal, barnacle on metal inside sensor, and battery voltage spikes
* 09/30/2014-10/03/2014 Hypoxic DO events
* 10/07/2014; 10/11/2014; 10/12/2014; 10/15/2014; 10/16/2014; 10/21/2014; 10/22/2014 Hypoxic DO events, possibly due to biofouling of logger tube
* 10/17/2014; 10/19/2014; 10/23/2014; 10/27/2014; 10/28/2014 Out of Range Turbidity spikes rejected
* 10/22/2014; 10/27/2014 Turbidity spikes >150 NTU rejected
* 10/14/2014 00:00-10/15/2014 23:45 Significant Rain Event
* 11/09/2014-11/13/2014 Battery spikes due to being connected to and receiving external power from telemetry. Will continue to receive external power from now on.
* Turbidity spikes due to rain, river discharge, and/ or wind resuspension
  + 11/1 2:30-18:45
  + 11/2 00:00, 00:30-5:30
  + 11/14 3:30-7:15
  + 11/15 7:15-11:15, 12:45
  + 11/17 14:00-11/18 00:00
  + 11/22 18:00-11/23 00:15
  + 11/26 6:00-7:00, 7:30-45, 11:15-12:30, 13:15-45
  + 12/6 1:15
  + 12/7 17:45-12/8 1:15
  + 12/8 2:15-5:30, 15:00-18:00
* Significant Rain Events
  + 11/17 22:15-11/18 00:00
  + 11/18 2:45-10:15
  + 11/23 00:30-17:30
  + 11/25 20:15-11/26 2:15
* 12/24/2014 00:00-7:15 Increase in depth corresponds with increase in salinity and turbidity
* 12/11/2014 5:45-11:30 Suspect high pH reading before retrieval
* 12/11/2014 12:15-13:15Suspect depth the bail might have gotten caught, which has happened before, and then dislodged after a little bit.
* 12/28/2014 Hypoxic DO event, possibly due to biofouling of logger tube,
* 12/28/2014 8:00-9:45, 9:15-30 Low pH readings correspond with hypoxic DO event

**East Bottom**

* 01/03/2014 9:15-1/04/2014 18:30 Increase in turbidity values and a spike probably due to high river discharge and wind resuspension, reject values >150 NTU
* Small increase in turbidity values and spikes probably due to mud and rain
  + 1/6 13:30-1/7 2:30
  + 1/7 6:45-17:00
* 01/11/2014 14:00 – 16:45 Turbidity spike possibly due to rain, river discharge, and/ or wind resuspension
* 01/13/2014 12:15-13:00 Suspect pH at beginning of deployment. Values are a little lower than the end of the last deployment
* Turbidity spikes correspond with low salinity readings
  + 01/17/20141415-01/18/2014 0000; 01/21/20141530-2115; 01/22/2014 115-415; 02/15/2014 300-430; 03/12/2014 1145-1715; 03/13/2014 1145-1600; 03/16/2014 1800-1830; 03/26/2014 230-300, 415-430, 1100-1200; 03/28/2014 1730-1745; 04/27/2014 1500-1630
* 01/29/2014 12:30-19:00 Turbidity spike due to rain, river discharge, and/ or wind resuspension
* 02/06/2014 6:00-9:45 Turbidity spikes due to rain, river discharge, and/ or wind resuspension
* 02/07/2014 @ 13:30-13:45 Rejected all data due to data sonde being out of water for station move
* 02/11/2014;03/08/2014-03/10/2014 Hypoxic DO events
* 02/12/2014 11:30-12:30 Small turbidity spike due to rain, river discharge, and/ or wind resuspension
* 04/01/2014 @ 8:00-8:15 Rejected pH data due to readings being 0.3 units off compared to the YSI handheld readings
* 04/07/2014 15:15 -04/08/2014 3:45 Turbidity spike possibly due to rain, river discharge, and/ or wind resuspension
* 04/08/2014 14:45-04/09/2014 00:30 , 04/09/2014 3:45-4:15 Turbidity spikes due river discharge – flood stage
* 04/15/2014 5:30-16:15, 21:00-23:30 Turbidity spikes increase in numbers due to rain and high river discharge
* 04/08/2014 @ 09:15 All data rejected due to Data Logger being out of water for telemetry work
* 06/02/2014; 06/04/2014; 07/13/2014 Hypoxic DO events
* 06/01/2014 23:30-06/04/2014 13:30 High salinity due to low river flow
* 06/04/2014 13:45-06/11/2014 12:15 Data rejected because no data for rest of deployment, 06/11/2014 2;30 - 06/20/2014 13:00 data missing due to power failure
* 06/29/2014 12:00-06/30/2014 7:00, 7/1 13:45 Turbidity spike possibly due to rain, river discharge, and/ or wind resuspension
* Suspect high DO values, >120%
  + 7/3 3:15-45
  + 7/5 2:15-3:15
  + 9/718:30, 19:00-45
  + 9/8 17:30
  + 9/9 18:30
  + 9/10 17:45
  + 10/7 18:30, 19:15
  + 11/6 12:30, 13:00, 13:30, 14:00, 19:00
  + 12/7 21:45
  + 12/9 17:00-30, 21:15
  + 12/10 16:15-18:30, 20:30-23:15
  + 12/11 1:15-2:00, 15:30-17:15
  + 12/12 13:15-21:15, 21:45-22:45
  + 12/13 00:15-6:45, 7:15
  + 12/13 12:15 – 12/15 00:15
  + 12/15 00:45-1:15, 21:15-30, 3:30-5:00, 5:30
  + 12/15 7:45-12/17 4:15
  + 12/17 7:15-8:30, 12:15-45, 13:30-14:00, 14:30-20:30
  + 12/18 1:15-12/20 8:30
  + 12/18 11:30-12/19 6:45
  + 12/19 7:15, 9:45-10:15, 11:00, 11:30
  + 12/20 9:00-15, 9:45-22:15
* 07/17/2014 2:45-15:45 Gap in time between deployments
* 07/17/2014 16:00-08/06/2014 9:15 All Turbidity data suspect, unclear when wiper fell off during deployment
* 07/27/2014; 07/30/2014-08/06/2014 Hypoxic DO events
* 08/06/2014 9:30-08/20/2014 9:00 All data other than date & time failed to save to sonde
  + Date and Time would change after viewing another screen in Eco watch. Pre-deployment AM Cal Date & Time had to be reset so it didn’t start logging at the correct time due to this malfunction
* 08/20/2014 9:15 -09/03/2014 9:00 Suspect all DO readings because deployment & retrieval readings differ greatly from handheld YSI readings, OOR DO post-cal
* 08/20/2014 9:15-09/03/2014 9:00 Suspect Depth cause unknown, unusually low; temperature, salinity and pH values closely match handheld readings and turbidity values appear normal for the site.
* 08/24/2014; 09/03/2014-09/06/2014; 09/20/2014-09/21/2014 Turbidity spike possibly due to rain, river discharge, and/ or wind resuspension
* 09/03/2014-09/06/2014; 09/09/2014; 09/13/2014-09/23/2014 Hypoxic DO events
* 09/09/2014 3:15, 09/10/2014 4:00Turbidity spikes rejected >150NTU
* 09/23/2014-10/04/2014 Hypoxic DO events
* Turbidity spike possibly due to rain, river discharge, and/ or wind resuspension
  + 10/2 12:45, 14:30-19:30; 10/3 7:45-8:00, 10:30, 13:00, 14:15-30, 15:15-17:15; 10/4 13:45-14:30; 10/5 10:15-11:00; 10/6 9:30, 11:30; 10/16 10:15-30; 10/17 11:15, 18:00; 10/20 8:30
* 10/11/2014; 10/15/201-10/25/2014; 10/27/2014; 10/28/2014 Hypoxic DO events
* 10/14/2014 00:30-10/15/2014 23:45 Significant Rain Event
* 10/28 8:45 There is an odd jump in depth at the beginning of this deployment. It may be the result of the bail getting caught and then the sonde lowering to the correct depth.
* 10/29/2014-10/31/2014; 11/12/2014 Hypoxic DO Events
* Turbidity spike possibly due to rain, river discharge, and/ or wind resuspension
  + 11/17 11:00
  + 11/18 12:30-45
  + 12/7 13:45, 14:30-15:15
  + 12/8 14:45-16:00
* 11/25/2014 @ 15:15-16:00 Suspect all data infield maintenance
* 11/25/2014 @ 16:45 Suspect all data, inconsistent with readings before and after it
* 11/26/2014 9:00-18:45, 11/27/2014 12:15-11/28/2014 23:45 Low salinity readings due to increased river flow
* 12/22/2014 3:30-12/31/2015 23:45 Catastrophic Temperature Sensor Failure reject all data

**East Surface**

* Increases in turbidity values and spikes that are probably due to high river discharge or rain events are marked 0 CTS from January in to February
* Significant rain events
  + 1/29 10:00-30
  + 1/29 13:15-19:00
  + 2/6 6:00-9:15
  + 2/12 11:30-12:15
* 02/07/2014 @ 13:00-13:15 Rejected all data due to data sonde being out of water for station move, January 2014 move approved by Oversight committee
* Suspect high DO values, >120%
  + 2/7 20:00-30
  + 6/9 15:45-17:30
  + 6/10 14:15-19:30
  + 6/11 15:30
  + 6/26 16:15-45
  + 6/27 15:00
  + 6/29 15:45, 17:15
  + 6/30 14:45-15:45
  + 7/2 15:30-16:15, 16:45, 17:45-18:00, 18:45
  + 7/3 14:45-16:00
  + 7/11 14:30
  + 11/5 17:45, 18:30-20:00
  + 11/6 18:45, 19:45-20:15
  + 11/21 12:00-16:30, 22:45
  + 11/22 12:30-14:15
  + 12/7 14:15-15:45
  + 12/9 15:30-45, 16:15-17:15, 21:45-22:15
  + 12/10 15:00-18:15, 21:15-45
  + 12/11 15:15-21:15, 22:30-23:00, 23:30
  + 12/12 1:15-30, 12:00, 14:00-21:00, 21:30
  + 12/12 22:15-12/13 2:45
  + 12/13 3:30-6:15, 9:45-21:45
  + 12/13 22:45-12/14 4:00
  + 12/14 6:00-15, 6:45-7:30, 10:15-30, 11:15-22:15
  + 12/14 23:15-12/15 4:00
  + 12/15 13:15-30, 14:00-23:30
  + 12/16 00:15-11:30, 12:15-19:45, 20:15-21:00, 22:00-30
  + 12/17 00:30-1:00, 13:30-19:45
  + 12/18 1:30-45, 11:45-12/19 00:00
  + 12/19 00:30-45, 1:45-5:00, 5:30-6:00, 11:15, 12:15-12/20 7:45
  + 12/20 11:00-12/21 2:00
  + 12/21 5:15-30, 6:00, 12:30-14:15, 14:45-16:15
  + 12/22 13:30-17:45, 19:15, 119:45-20:15
  + 12/23 5:45-6:15
  + 12/26 19:30-20:00
  + 12/27 18:00-20:30, 21:30-22:15
  + 12/28 00:30, 6:45
* 02/07/2014 13:30 Suspect turbidity spike
* 02/12/2014; 02/15/2014; 02/27/2014 Small turbidity spike due to rain, river discharge, and/ or wind resuspension
* 03/16/2014 18:00-20:45 Small turbidity spikes probably due to rain
* 03/26/2014 10:45-04/01/2014 8:00 Turbidity is suspect due to small increase in values and mud on sensor
* 04/01/2014 @ 8:00 Rejected pH due to readings being 0.2 units off compared to YSI handheld readings
* 04/08/2014 @ 08:45-9:00 Rejected all data due to Data Logger being out of water for telemetry work
* Turbidity spikes due to rain, river discharge, and/ or wind resuspension
  + 4/7 15:00-23:00
  + 4/8 00:45-3:15, 13:45-4/9 00:00
  + 4/15 4:15-15:45, 20:00-23:00
* 04/21/2014 Turbidity spikes due to rain, river discharge, and/ or wind resuspension
* 06/02/2014-06/05/2014 Hypoxic DO events
* 06/02/2014 6:30-06/04/2014 13:15 High salinity due to low river flow
* 06/18/2014 00:00 Turbidity spike rejected, 510 NTU
* 06/20/2014 @ 13:15-13:30 Suspect all data disjointed
* 07/02/2014 @12:45- 13:15 Suspect DO and pH drift
* 07/17/2014 15:00-8/6/2014 7:45All Turbidity, DO %, and DO mg/L data suspect, unclear when wipers fell off during deployment
* 07/30/2014 21:00-08/06/2014 7:45 Reject Turbidity values > 150 NTU
* 08/06/2014-08/14/2014; 08/18/2014; 08/20/2014 Hypoxic DO events
* 08/20/2014 9:15-09/03/2014 7:45 Logger failed to start logging
* 09/03/2014 8:00-09/23/2014 8:00 All DO data suspect OOR post cal and different values than field data
* 09/23/2014-10/05/2014 Hypoxic DO events
* 10/07/2014 9:30-10/28/2014 17:15 Logger failed to log
* 11/11/2014-11/12/2014 Hypoxic DO Events
* 10/30/2014 @ 12:30 Rejected all data due to in field maintenance, swapped East Bay logger
* 11/01/2014; 11/17/2014 Turbidity spikes due to rain, river discharge, and/ or wind resuspension
* 11/24/2014 8:30-11/25/2014 16:00, 11/25/2014 17:15-11/25/2014 23:45 Significant rain event, coincides with drop in pH and salinity
* 11/25/2014 @16:15-17:25 Suspect all data due to infield maintenance
* 12/07/2014-12/08/2014; 12/24/2014 Turbidity spikes due to rain, river discharge, and/ or wind resuspension
* 12/25/2014 6:00-12/26/2014 18:45; 12/28/2014 12:00-12/30/2014 23:00Significant rain event, coincides with drop in pH and salinity

**Weather and River information** (Apalachicola River at Sumatra useless stated otherwise)

* 7/02/2014-7/07/2014 Rained 7/02/2014-7/03/2014; 7/10/2014-7/17/2014
  + 7/11/2014 ~ 1.5”
  + Apalachicola River discharge 15000-10500 ft3/sec
  + 7/03/2014 discharge fell below 36 year Median Daily Discharge (MDD) and stayed within 1000 ft3/sec of MDD till 7/8/2014
* 7/17/2014-8/06/2014 Rained 7/17/2014; 7/20/2014-7/22/2014; 7/26/2014-7/29/2014; 8/4/2014-8/6/2014
  + 7/20/2014; 7/21/2014; 7/29/2014; 8/04/2014; 8/05/2014 ~ 1.5”
  + Apalachicola River discharge increased from 10500 ft3/sec on 7/17/2014 to 17500 ft3/sec on 7/28/2014 and slowly decreased over the rest of the deployment.
  + Discharge surpassed 36yr MDD on 7/24/2014 and fell back below it on 8/05/2014; graph of discharge mirrored 36yr MDD; on 7/17/2014 discharge was 5500 ft3/sec above 36yr MDD
* 8/06/2014-8/20/2014 Rained 8/06/2014-8/20/2014
  + 8/19/2014 ~ 1.5”
  + Apalachicola River discharge decreased from 12100 ft3/sec on 8/06/2014 to 9800 ft3/sec on 8/11/2014; increased to 13700 ft3/sec by 8/18/2014; and decreased to 12000 ft3/sec on 8/20/2014
  + Discharge was below 36yr MDD for entire deployment
* 8/20/2014-9/03/2014 Rained 8/20/2014-8/25/2014; 8/27/2014; 8/30/2014-9/03/2014
  + Apalachicola River discharge decreased from 12000 ft3/sec 8/20/2014 to 10900 ft3/sec on 8/23/2014; increased to 12800 ft3/sec on 8/26/2014; and decreased to 8900 ft3/sec by 9/03/2014
  + 8/26/2014-9/02/2014 discharge stayed within roughly 2000 ft3/sec of 36yr MDD
* 9/3/2014-9/23/2014 Rained 9/04/2014-9/21/2014; 9/23/2014
  + 9/7/2014; 9/10/2014 ~ 2-2.5”
  + Apalachicola River discharge decreased from 9000 ft3/sec on 9/3/2014 to 8000 ft3/sec on 9/6/2014; increased to 12700 ft3/sec on 9/14/2014; deceased to 11700 ft3/sec on 9/17/2014; increased 13800 ft3/sec on 9/21/2014; and decreased to 13000 ft3/sec on 9/23/2014
  + 9/12/2014-9/23/2014 discharge was within 2000 ft3/sec of MDD but never surpassed it
* 9/23/2014-10/07/2014 Rained 9/23/2014; 9/28/2014-9/30/2014; 10/04/2014
  + 9/29/2014 ~ 3-4”; 9/30/2014 ~ 2-2.5”
  + Apalachicola River discharge decreased from 12500 ft3/sec on 9/23/2014 & leveled off at 10800 ft3/sec on 9/29/2014, before decreasing to 8500 ft3/sec on 10/05/2014. Then increased to 10000 ft3/sec on 10/07/2014.
* Discharge roughly followed the 36 MDD
* 10/07/2014-10/28/2014 Rained 10/09/2014; 10/11/2014
  + Sever Rain on 10/14/2014 ~6-8”; 10/15/2014 ~3-4”
* Apalachicola River Discharge increased from 9300 ft3/sec on 10/07/2014 to 10500 ft3/sec on 10/11/2014; decreased to 9500 ft3/sec on 10/12/2014 13500 ft3/sec; increased to 16000 ft3/sec on 10/14/2014; decreased to 13500 ft3/sec on 10/16/2014; increased to 17500 ft3/sec on 10/24/2014; and then decreased to 15300 ft3/sec on 10/28/2014.
* Discharge surpassed the 36 year MDD from 10/14/2014 on
* 10/28/2014-11/13/2014 Rained 10/30/2014-11/01/2014; 11/07/2014
* River discharge dropped from 15300 ft3/sec on 10/28/2014 to 9300 ft3/sec on 11/02/2014; discharge fluctuated for the rest of the deployment and never exceeded 9900 ft3/sec; on 11/13/2014 discharge was 8400 ft3/sec
* Discharge fell below 36 year MDD on 10/31/2014 and was 1000 ft3/sec or more below the 36 year MDD for the rest of the deployment
* 11/13/2014-12/11/2014 Rained 11/17/2014-11/18/2014; 11/23/2014-11/26/2014; 12/7/2014; 12/9/2014
  + 11/18/2014 ~2”; 11/23/2014 ~3”; 11/24/2014 ~3”; 11/25/2014 ~4”
* River discharge dropped from 8400 ft3/sec on 11/13/2014 to 8000 ft3/sec on 11/15/2014; increased to 10000 ft3/sec on 11/18/2014; fell to unknown due to missing data; 11/21/2014 increased from 9200 ft3/sec surpassing the 36 yr MDD of 10300 ft3/sec on 11/24/2014 and continued to increase to 20500 ft3/sec on 12/1/2014; dropped below 36 yr MDD of 10600 ft3/sec on 12/8/2014 before reaching 12500 ft3/sec on 12/11/2014
* 12/11/2014-1/6/2015 Rained 12/17/2017; 12/20/2014-12/26/2014; 12/29/2014-12/30/2014
  + 12/24/2014 ~6-8”; 12/29/2014 ~1.5-2”; 12/30/2014 ~1-1.5”
* Discharge dropped from 12500 ft3/sec on 12/11/201 to 10500 ft3/sec on 12/13/2014; then increased to 12200 ft3/sec on 12/16/2014 before fluctuating between 12000 ft3/sec and 10800 ft3/sec until 12/23/2014; discharge then rapidly increased from 12000 ft3/sec on 12/23/2014 to 24000 ft3/sec on 12/24/2014; continued to increase but at lower rate till reaching 34000 ft3/sec on 12/31/2014
* Discharge surpassed 36 yr MDD at 18000 ft3/sec on 12/24/2014 and never fell below 36 yr MDD for rest of deployment