**Central Panhandle Aquatic Preserves (CPAP)
Water Quality Metadata Report**

September – December 2019
Latest Update: 08/09/2021

**I. Data Set and Research Descriptors**

1. **Principal investigator & contact persons:**

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1. **Entry verification:**

YSI data are downloaded directly from the YSI 6600 EDS (extended deployment system) into the EcoWatch (version 3.15) software, plotted, and initially analyzed for major anomalies and missing data. YSI raw data files are then downloaded as a comma delimited file (.cdf) and imported into Microsoft Excel as a comma-space delimited file (.csv). These raw data files are then organized into standardized monthly data sets. The monthly files are carefully edited by staff for data anomalies that are identified in the dataset and Section 14 of this document. Data are rejected or rejected when the sonde malfunctioned, probes malfunctioned, data are out of range for a particular site, or the sonde is out of the water.

Data are pre-processed in Excel using the macros to correct any time stamp errors, convert data into proper units, and make sure parameters are in the correct order. Anomalous data found during the initial QA/QC process are flagged and/or rejected in Excel. Jonathan Brucker is responsible for the QA/QC process and data management.

Beginning in July 2018, data underwent a two-step (primary and secondary) Quality Assurance/Quality Control (QA/QC) procedure as outlined in the NERRS CDMO Data Management Manual Version 6.6 (<http://cdmo.baruch.sc.edu/request-manuals/>).

The primary QA/QC process was performed by the CDMO and involved inserting flag columns into the data files for each water quality parameter, creating a flag record column, and creating an automated process that applied standardized flags to data if the values were outside sensor specifications as determined by YSI, the instrument manufacturer. Yearly data files that completed the primary QA/QC process were returned to FCO staff for secondary QA/QC. Data were evaluated, and standardized flags and codes were applied to individual data points by insertion into the flag columns using the CDMO’s NERRQAQC Excel macro to provide further documentation of the data. Data files were then returned to the CDMO for ingestion into the Florida Aquatic Preserves database as provisional data. For more information on QA/QC flags and codes, see Sections 11 and 12.

1. **Research objectives:**

The Richardson’s Hammock station collected baseline water quality data in the southwestern area of St Joseph Bay Aquatic Preserve (SJBAP). Richardson’s Hammock is surrounded by lush seagrass beds, known as a shark breeding ground, congregating snapper populations, and juvenile green turtle habitat. This southern portion of St Joseph Bay has low flow compared to the northern portion of the Bay which Gulf water flushes out more frequently. Richardson’s Hammock is separated from the Gulf of Mexico by a narrow strip of land. In the event of a large storm, it is possible that this area could be washed out and the Gulf waters flow directly into the Bay at Richardson’s Hammock.

Datalogger stations established within Alligator Harbor Aquatic Preserve (AHAP) contribute to the establishment of baseline water quality conditions and provide valuable insight into the health of AHAP. Alligator Harbor is located on the southeast coast of Franklin County just east of the Apalachicola estuary. The actual harbor is approximately 4,045 acres and is a shallow system with rather consistent salinity levels and sand/mud substrate. There is little freshwater flow into the harbor and the rather stable salinity structure does not create the estuarine conditions characteristic of the waterbodies lying to the west. However, the seagrass habitat, oyster bars, beaches, saltmarshes, and bottom communities found associated with Alligator Harbor Aquatic Preserve make it a productive and integral part of the marine ecosystem in the Franklin County area. Aquaculture is a primary use of AHAP, and a good water quality is vital to the industry. This data will be extremely useful to local stakeholders and federal, state, and local agencies managing resources in and adjacent to the preserve.

1. **Research Methods:**

As an Office of Resilience and Coastal Protection-wide initiative in 2005, Central Panhandle Aquatic Preserve (CPAP) began monitoring water quality with the use of YSI 6600 dataloggers. The aquatic preserve has modeled its datalogger water quality monitoring project after the National Estuarine Research Reserve’s (NERR) System-Wide Monitoring Program (SWMP) that uses nationally standardized methods of data collection to ensure continuity and accuracy. Stations were established in St. Joseph Bay and Alligator Harbor, and abiotic factors including dissolved oxygen, salinity, temperature, conductivity, pH, turbidity, and depth were continuously monitored every 30 minutes. Dataloggers are swapped out in two-week intervals for data retrieval, instrument service and calibration, and monitoring station maintenance. The data are downloaded and reviewed as part of quality assurance and quality control, then analyzed and plotted in order to determine trends. The aquatic preserve stores data on a local server and utilizes the NERRs CDMO Data Management Office archival storage and data management. These data are used to identify trends in water quality for specific areas and allows the aquatic preserve to track environmental changes in the ecosystem.

In July 2005, the Richardson’s Hammock site was established on the St. Joseph Bay Aquatic Preserve (SJBAP), and in August 2006, another station (Windmark) was added in SJBAP. In September 2007, the Windmark station was discontinued in order to expand water quality efforts into other bays within CPAP. In October 2007, the Alligator Harbor datalogger site was added to the program. Due to budget and staffing limitations, data were collected intermittently between 2005-2011, and the 2011 office closure resulted in the suspension of the datalogger program and transfer of datalogger units to other aquatic preserve offices.

After the management of CPAP was re-established in 2016, water quality monitoring programs started to resume. In 2018, CPAP reacquired 6-Series sondes and began rebuilding the sonde program. In September 2019, two new sites were established in AHAP: one at the aquaculture sites in Alligator Harbor and one at the Florida State University Coastal and Marine Laboratory (FSUCML). In March 2021, a third station was added on St. Joseph Bay, in very close proximity to the historical Windmark station.

YSI 6600 EDS model sondes are used to collect data at every site. Prior to deployment, YSI 6600 EDS’s 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 3.0 (with addendum 11/01) document. Lab grade conductivity standards (Fisher Brand) are initially used to calibrate the YSI’s, 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 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. Pressure is measured using a hand-held Garmin unit and the depth offset from zero meters is determined using the tables provided in the Water Quality SOP. The dissolved oxygen % is also calibrated based on the barometric pressure for the day, changing the standard each time it is calibrated. Prior to this, a default atmospheric pressure of 760 mmHg was used to calibrate the dissolved oxygen % to 100%. The 6136 turbidity 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 are collected by sondes at 15-minute intervals. They are wrapped in 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.

During deployment and retrieval of the sondes, measurements of dissolved oxygen concentrations and percent saturation, as well as salinity and temperature, are taken at the sites using a hand-held YSI Pro DSS instrument. Wind is measured with a Kestrel and pH with a pH meter.

YSI 6600 EDS dataloggers are contained within a 10 cm (inside diameter) PVC housing pipe mounted vertically on the channel marker. To facilitate water flow across the sensors, several holes are drilled into the submerged portion of the pipe. Hole density is greatest near the base where the sonde sensors are located. The PVC pipe is placed on the channel marker using stainless steel hose clamps. 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.

1. **Site location and character:**

The Central Panhandle Aquatic Preserve Office is located in northwest Florida and is part of the Department of Environmental Protection’s Office of Resilience and Coastal Protection. The Preserve is responsible for the management of four Aquatic Preserves in Franklin, Gulf and Bay counties. These include Alligator Harbor Aquatic Preserve (14,184 acres), Apalachicola Bay Aquatic Preserve (80,000 acres), St. Joseph Bay Aquatic Preserve (55,674 acres) and St. Andrews Aquatic Preserve (24,000 acres).

St. Joseph Bay Aquatic Preserve is located in Gulf County along Highway 98 near the community of Port St. Joe, in Florida’s Northwest Panhandle approximately 35 miles southeast of Panama City and approximately 100 miles southwest of Tallahassee. St. Joseph Bay is bound on the eastern shoreline by the city of Port St. Joe and St. Joseph Bay State Buffer Preserve lands and on the west by the St. Joseph Peninsula and St. Joseph Peninsula State Park. The Bay is approximately 15 miles long north to south, with a maximum width of 6 miles, and opens north to the Gulf of Mexico, thru a relatively narrow opening. St. Joseph Bay Aquatic Preserve covers approximately 55,674 acres along the northern coast of the Gulf of Mexico. St. Joseph Bay is unique in being the only body of water in the eastern Gulf of Mexico that is not influenced by the inflow of fresh water. Because of this, these coastal waters tend to be clearer with sandier sediments than in the north central Gulf of Mexico. These conditions make the bay ideal habitat for the growth of lush seagrass communities. Much of the productivity of the region is attributed to the near shore saltmarsh and seagrass habitats that serve as nursery and foraging grounds for a variety of commercial and recreational fish and invertebrate species, sea turtles, scallops and birds. Seagrasses cover one-sixth of the bay bottom in St. Joseph Bay and expand approximately 9,669 acres. Salt marsh habitat spans approximately 762 acres.

The Richardson’s Hammock datalogger site in St. Joe Bay is in the southwestern portion of the Bay, furthest from the opening to the Gulf. The datalogger is attached at the end of a dock on state property accessed by car off Cape San Blas Road. This site in the Bay is separated from the Gulf by a very narrow strip of land (Cape San Blas). In the event of a large storm or hurricane it is possible, and has happened in the past, that the Gulf may wash into the Bay at this site. It is important to monitor this area to collect baseline data and, in the event that the Gulf connects to the Bay at this spot, to monitor the changes that may occur. The Windmark datalogger station is located North of the Port St. Joe shipping channel; the sonde is housed at the end of a dock of a private residence. It is important to monitor water quality conditions at this location, since the shipping channel has been considered a major cause of turbidity and salinity fluctuations in St. Joseph Bay. To accurately assess the impacts of the shipping channel on St. Joseph Bay, the establishment of baseline water quality data sets is imperative.

Alligator Harbor is located on the southeast coast of Franklin County just east of the Apalachicola estuary. The actual harbor is approximately 4,045 acres. Alligator Harbor is a shallow system with rather consistent salinity levels. There is little freshwater flow into the harbor and the rather stable salinity structure does not create the estuarine conditions characteristic of the waterbodies lying to the west. Seagrass habitat, oyster bars, beaches, saltmarshes, and bottom communities found associated with Alligator Harbor Aquatic Preserve make it a productive and integral part of the marine ecosystem in the Franklin County area. The Preserve currently does not have dataloggers located in Alligator Harbor. The Preserve maintained a datalogger in Alligator Harbor on a private dock from October 2007 through August 2008. Historically, the Division of Agriculture and Consumer Services (DACS) Aquaculture division maintained a datalogger located on Marker M at the aquaculture leases from 2002-2012. This site was decommissioned due to budget cuts. In September 2019, CPAP established two sites in AHAP: one at the aquaculture sites in Alligator Harbor (Marker M) and one at the Florida State University Coastal and Marine Laboratory (FSUCML).

The Apalachicola Bay Aquatic Preserve is located within the Apalachicola National Estuarine Research Reserve boundaries and is located adjacent to the City of Apalachicola. The Reserve has been monitoring water quality through the use of dataloggers in the bay since 1992. CPAP currently does not have dataloggers located in the Apalachicola Bay Aquatic Preserve; however, the Apalachicola National Estuarine Research Reserve currently deploys four dataloggers in Apalachicola Bay with data going back to 1992.

The St. Andrews Aquatic Preserve is located in Bay County and includes St. Andrew Bay Proper, Shell Island Sound, and offshore areas. CPAP currently does not have dataloggers located in the St. Andrews Aquatic Preserve, but staff are working to secure funding for new sondes and an appropriate location for a sonde station.

**Table 1: Station Descriptions**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Station Code | Station Name | Location | Active Dates | Reason Decommissioned | Notes |
| HA 2005-2006RH 2006-2011 | Richardson’s Hammock | 29.687-85.3612 | July 2005 – June 2011 | Lack of staff/Office closure | It is unknown why station code was changed. |
| WI (2006)WM (2007) | Windmark | 29.84827-85.33584 | August 2006 – September 2007  | Lack of staff/Office closure | It is unknown why station code was changed. |
| AH | Alligator Harbor | 29.89782-84.37723 | October 2007 – August 2008 | Lack of staff/Office closure | NA |
| AH2 | Alligator Harbor | 29.91813-84.40969 | September 2019-Present | N/A | N/A |
| FS | FSUCML Channel | 29.91013-84.51112 | September 2019-Present | N/A | N/A |

1. **Data collection period:**

Deployment dates and time are as follows for 2010:

BEGAN ENDED

**Alligator Harbor**

09/12/2019 09:45 09/26/2019 09:15

09/26/2019 09:30 10/15/2019 09:30

10/15/2019 09:45 11/07/2019 12:00

11/07/2019 12:15 12/06/2019 10:30

12/06/2019 10:45 01/22/2020 13:00

**FSUCML Channel**

09/12/2019 09:15 09/26/2019 08:45

09/26/2019 09:00 10/15/2019 08:30

10/15/2019 08:45 11/12/2021 12:30

11/12/2019 13:15\* 12/06/2019 09:30

12/06/2019 09:45 01/22/2020 11:45

1. **Distribution:**

The Principle Investigator (PI) retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the PI and Aquatic Preserve (AP) 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. 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. Water quality data and metadata can be obtained from the PI (see section 1).

1. **Associated researchers and projects:**

Additional information is currently unavailable

**II. Physical Structure Descriptors**

1. **Sensor specifications**:

### Table 2. YSI 6600 EDS data sonde

Parameter: Temperature

Units: Celsius (C)

Sensor Type: Thermistor

Model #: 6560

Range: -5 to 45 °C

Accuracy: +/-0.15 °C

Resolution: 0.01 °C

Parameter: Conductivity

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

Sensor Type: 4-electrode cell with auto-ranging

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 dependent)

Parameter: Salinity

Units: parts per thousand (ppt)

Sensor Type: Calculated from conductivity and temperature

Range: 0 to 70 ppt

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

Resolution: 0.01 ppt

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 the reading

Resolution: 0.1 % air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature and salinity)

Units: milligrams per Liter (mg/L)

Sensor Type: Rapid Pulse – Clark type, polarographic

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

Parameter: Non-Vented Level – Shallow (Depth)

Units: feet or meters (ft or m)

Sensor Type: Stainless steel strain gauge

Range: 0 to 30 ft (9.1 m)

Accuracy: +/- 0.06 ft (0.018 m)

Resolution: 0.001 ft (0.001 m)

Parameter: pH (specify whether EDS probe or not)

Units: units

Sensor Type: Glass combination electrode

Model #: 6561

Range: 0 to 14 units

Accuracy: +/- 0.2 units

Resolution: 0.01 units

Parameter: Turbidity

Units: nephelometric turbidity units (NTU)

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

Model #: 6136

Range: 0 to 1000 NTU

Accuracy: +/- 5 % reading or 2 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 Aquatic Preserves have upgraded to YSI 6600 EDS data sondes, which increase DO accuracy and longevity by reducing the environmental effects of fouling. The user is therefore advised to consult the metadata and to exercise caution when utilizing the DO data beyond the initial 96-hour time period. However, this potential drift is not always problematic for some uses of the data (e.g., periodicity analysis). It should be noted that the amount of fouling is site specific and that not all data are affected. The Principal Investigator at should be contacted concerning the reliability of the DO data because of the site and seasonal variation in the fouling of the DO sensor.

Depth Qualifier: The water quality monitoring program utilizes YSI data sondes that can be equipped with either depth or water level sensors. Both sensors measure water depth, but by convention, level sensors refer to atmospherically vented measurements and depth refers to non-vented measurements. Standard calibration protocols for the non-vented sensor use the atmosphere pressure at the time of calibration. Therefore, changes in atmospheric pressure between calibrations appear as changes in water depth. The error is equal to approximately 1.03 cm for every 1millibar change in atmospheric pressure. This error is eliminated for level sensors because they are vented to the atmosphere throughout the deployment time interval. If proper atmospheric pressure data is available, non-vented sensor depth measurements can be corrected for deployments between calibrations. Readings for both vented and non-vented sensors are automatically compensated for water density changes due to variations in temperature and salinity. The Principal Investigator should be contacted in order to obtain information regarding atmospheric pressure data availability. All data sondes used at all 6600 sites in 2006 were non-vented models.

Salinity Units Qualifier: 6600 series sondes report salinity in parts per thousand (ppt) units and the EXO sondes report in practical salinity units (psu). These units are essentially the same and for the AP water quality program purposes are understood to be equivalent, however psu is considered the more appropriate designation. Moving forward the AP program will assign psu salinity units for all data regardless of sonde type.

Turbidity Qualifier: 6600 series sondes report turbidity in nephelometric turbidity units (NTU) and the EXO sondes use formazin nephelometric units (FNU). These units are essentially the same but indicate a difference in sensor methodology, for AP water quality program purposes they will be considered equivalent. Moving forward, the AP program 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.

1. **Coded variable definitions:**

Raw file naming protocol: 6-numeral deployment site name/month/date of deployment/ /year (e.g. AH091219 = Alligator Harbor deployment beginning September 12, 2019).

Pre-processed file naming protocol: YSI deployment site/month/year (e.g. AH0107 = Alligator Harbor data from January 2007).

Site definitions:

Sampling Station: Sampling site code:

Alligator Harbor 2 AH2

FSUCML Channel FS

1. **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

1. **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

1. **Post deployment information:**

**Post-deployment readings of 6600 EDS sondes deployed at the Alligator Harbor 2 site during 2019.**

 **pH Temp (C) SC (mS/cm) DO % Turbidity (NTU) Depth (m)**

**Date/Std. 7.00 N/A 50.00 100.0 0.0 N/A**

09/26/19 N/A N/A 50.04 104.1, 104.2 2.0 0.028

10/15/19 N/A N/A 48.38 79.2, 79.9 -1.8 10.504

11/7/19 7.09 N/A 54.16 100.5, 99.9 2.3 0.088

12/06/19 7.17 N/A 48.87 101.1, 100.9 0.0 0.147

01/22/20 7.27 N/A 52.65 102.5, 101.8 0.4 0.036

**Post-deployment readings of 6600 EDS sondes deployed at the FSUCML Channel site during 2019.**

 **pH Temp (C) SC (mS/cm) DO % Turbidity (NTU) Depth (m)**

**Date/Std. 7.00 N/A 50.00 100.0 0.0 N/A**

09/26/19 N/A N/A 49.27 101.0, 100.8 1.8 0.030

10/15/19 N/A N/A 50.06 100.9, 100.6 -1.3 0.354

11/12/19 7.10 N/A 53.29 100.6, 100.6 0.3 0.082

12/06/19 7.28 N/A 49.97 100.3, 99.9 -0.2 0.151

01/22/20 6.75 N/A 53.37 99.8, 100.1 -2.8 0.041

1. **Other remarks/notes:**

**Missing Data**

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. If additional information on missing data is needed, contact the Principal Investigator.

**Anomalous/Suspect data:**

**Note #1:** Slight shifts in data are sometimes correlated with sonde exchanges. These shifts are most noticeable in pH, specific conductivity, salinity, DO% and DO conc, and may be related to sensor drift (e.g., due to fouling) and/or calibration/performance differences between sondes.

**Note #2:** Turbidity “outliers” (i.e., values that are negative or greater than 1000 NTU for 6600 series sondes and 4000 NTU for EXO series sondes) were not deleted from the monthly records. Readings greater than 1000 NTU for 6600 series sondes and 4000 NTU for EXO series sondes are considered out of range and are rejected. They have been left in the database to provide users with a complete dataset and to allow true visual representation of the data in graphs. Negative turbidity values occur throughout the year at all four sites. Some of these negative values are within the accuracy range of the sensor (+/- 2.0 %) and, therefore, were not removed from the dataset. They were marked suspect with the CAF code.

**Note #3**: Turbidity data is subject to single and clusters of spikes that occur in the beginning and middle of deployments. Turbidity values that fall between 500 and 1000 are not specifically indicated as suspect data, but possibly could be interpreted as suspect. Turbidity spikes may be associated with wiper malfunction but mostly the reason is unknown. Data users should exercise caution when interpreting turbidity data that fall within this range.

**Note #4:** Time series profiles of the dissolved oxygen data at all monitoring stations sometimes exhibits brief “spikes” of reduced DO concentrations. These events appear to be coupled with the occurrence of slack tide conditions as well as the level of fouling associated with the sonde.

**Note #5:** All times in data files at all sites had to be adjusted post-deployment; more specifically, times were altered such that the readings occurred on the hour and half hour. It has been determined that this clock error is a software issue and has been resolved.

**Rejected Data:**

 Obvious outliers, data associated with probe malfunction, and/or calibration (both pre and post) problems are rejected as specified below. For more details about rejected data, contact the Principal Investigator.

**Station CPAH2:**

 **January – August**

1. Missing all data due to no sonde deployment.

**September 1-30, 2019**

1. Missing all data 09/01/2019 00:00:00 – 09/12/2019 09:30:00; sonde not deployed.
2. Missing pH data 9/12/2019 09:45:00 – 09/30/2019 23:45:00; probe not installed.
3. Rejected depth data 09/26/2019 09:30:00 – 09/30/2019 23:45:00; post-calibration out of range; bulkhead failure.
4. Shift in all data 09/26/2019 09:30:00 associated with sonde exchange.
5. Reject all parameters 09/26/2019 09:30:00 – 09/30/00 23:45:00; sonde/bulkhead failure, sonde was subsequently decommissioned in October.

**October 1-31, 2019**

1. Missing pH data 10/01/2019 00:00:00 – 10/15/2019 09:30:00; probe not installed.
2. Shift in all data 10/15/2019 09:45:00 associated with sonde exchange.
3. Reject all data 10/01/2019 00:00:00 – 10/15/2019 09:30:00; bulkhead failure, sonde was subsequently decommissioned.
4. Rejected all data 10/04/2019 12:15:00; values out of range, reason unknown, although may be indicative of sonde failure.

**November 1-30, 2019**

1. Dissolved oxygen probe failure starting 11/03/2019 06:15:00 – 13:30:00, 11/04/2019 00:00:00 – 13:30:00; reject all zero data 11/03/2019 06:15-13:30 and then again 11/04/2019 00:00 -13:30.
2. Suspect all data 11/07/2019 12:15:00 – 11/13/2019 07:45:00;sonde did not deploy to correct depth.
3. Suspect intermittent negative turbidity data 11/07/2019 16:00:00 – 11/30/2019 23:45:00; values out of range, reason unknown.

**December 1-31, 2019**

1. Shift in pH data at sonde exchange 12/06/2019; suspect data 12/03/2019 13:15:00 – 12/06/2019 10:45:00; may be due to sensor drift. .
2. Suspect intermittent negative turbidity data 12/01/2019 00:00:00 – 12/06/2019 10:30:00; values out of range, reason unknown.

**Station CPFS:**

**January – August**

1. Missing all data due to no sonde deployment.

**September 1-30, 2019**

1. Missing all data 09/01/2019 00:00:00 – 09/12/2019 09:00:00; sonde not deployed.
2. pH probe failure; reject data 09/25/2019 08:00:00- 09/26/2019 08:45:00; probe malfunction; bulkhead failure.
3. Missing pH data 09/26/2019 09:00:00 – 09/30/2019 23:45:00; probe not installed.
4. Suspect shift in all data 09/26/2019 08:45:00 associated with sonde exchange.
5. Rejected turbidity spike 09/25/2019 20:15:00; value out of range, reason unknown.
6. Suspect turbidity data for whole deployment (09/26/2019 09:00:00 –10/15/2019 08:30:00) due to intermittent negative values and sensor drift ; may be associated with calibration offset (post-deployment reading was -1.3 NTU in 0.0 NTU standard); same probe experienced failure in November deployment (probe # 14C103217).

**October 1-31, 2019**

1. Reject pH data 10/01/2019 00:00:00 – 10/15/2019 08:30:00; probe not installed.
2. Rejected turbidity spike 10/25/2019 22:00:00; value out of range, reason unknown.
3. Large drop in turbidity at the start of new deployment 10/15/2019 08:45:00.

**November 1-30, 2019**

1. Missing data 11/12/2019 12:45:00 and 13:00:00; associated with sonde tube maintenance.
2. Suspect turbidity spikes 11/02/2019 18:15:00, 11/06/2019 12:45:00 and 13:45:00, and 11/07/2019 08:45:00; values out of range, reason unknown. Octopus was encountered in tube at retrieval.
3. Reject turbidity data 11/14/2019 01:15:00 – 12/06/2019 09:30:00; turbidity probe failure indicated by flat-line, zero values; same probe as mentioned in September (probe # 14C103217).

**December 1-31, 2019**

1. Missing all data 12/30/2019 17:00:00 – 22:00:00, 22:30:00 – 23:45:00; 12/31/2019 00:00:00 – 02:00:00, 02:30:00 – 06:15:00, 06:45:00 – 15:30:00, 16:00:00 – 17:45:00, and 18:15:00 – 23:45:00; battery failure.
2. Reject intermittent negative turbidity data for entire deployment 12/06/2019 09:45:00 – 12/31:00 18:00:00; values out of range, may be due to calibration offset (post-deployment reading was -2.8 NTU in 0.0 NTU standard).